UNIVERSITETET I NORDLAND

HANDELSHØGSKOLEN

# MASTEROPPGAVE

## Learning in knowledge-intensive projects

Exploring the learning mechanisms behind dynamic capabilities

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## Preface

This thesis is written as a closing of my three-year MBA degree at Bodø graduate school of business. The thesis has a scope of 30 study points, and stretches over two semesters.

The background for my choice of topic and problem statement is first and foremost an interest in leadership of humans working towards a common goal. Also, I have an increasing interest in project as a work-form – a subject and work-form that I wish to gain greater knowledge about. Secondly I wish to use my pedagogical background to see other sides of how learning takes place in projects and project management in the private sector. The study seeks to contribute to an increased understanding of how learning takes place in knowledge-intensive project organizations and how project managers can understand and influence the learning processes in the project. Not a lot of research has been done focusing on how learning processes within knowledge-intensive project organizations can contribute to creating dynamic capabilities through learning. It is therefore very interesting to analyze how learning processes and learning systems are established, developed and used.

I wish to thank the GSC-project in Statoil, and especially Bjørn Birkeland, for all their help, goodwill and openness when conducting the data collection for this case study. I sincerely hope that the analysis, conclusions and implications made in this thesis can be of value to the case project and its respective stakeholders.

Further, I wish to express a sincere gratitude to my mentor, Tommy Høyvarde Clausen, for all his feedback and well-placed comments in the process of writing the thesis. Last, but not at all least, I wish to express a special thank you to my family, who have endured and sacrificed a lot in order for me to undertake, and now finish this master study.

Bergen, 10.06.2014

Andreas Reksten

## Abstract

This thesis seeks to explore and analyze the learning mechanisms that contribute in the creation of dynamic capabilities in a large knowledge-intensive project organization. Dynamic capabilities are defined as:

*"… a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness (Zollo and Winter, 2001)."*

The study will do this by looking at the dynamic between social, individual and organizational processes for learning. The thesis will seek to gain knowledge on how learning processes develop and are used within the framework of the three learning mechanisms identified in Zollo and Winter (2001) in a knowledge-intensive development project. The three generic learning mechanisms are *1) Experience accumulation, 2) Knowledge articulation* and *3) Knowledge codification.*

Theoretically, the thesis is founded upon the sociocultural learning perspective, which states that humans learn when they work with knowledge in a social setting/context. In a sociocultural perspective the attention is turned both towards the individual and the social context of which the learning takes place (Svanberg and Wille, 2009). Within this framework, the problem statement of the thesis is: *"How are learning mechanisms used in the creation of an organization's dynamic capabilities in knowledge-intensive project organizations?"*

The research method used is a qualitative case study, and the study builds its analysis on observations and empirical data collected by following a large project within groundbreaking subsea technology. The project is an IOR-project initialized and led by Statoil on the Gullfaks-field in the North Sea. A total of 6 in-depth interviews and three observation sessions made up the primary data for the thesis.

The most important findings of the thesis are that a fairly high degree of individual learning and individual initiative is present in a knowledge-intensive project with high engineer-

density. The individuals of the project are recognized by a high level of skill and mastery, and are mainly driven by inner motivation. They possess a high degree of self-efficacy, making them

The most important findings of the thesis are that a fairly high degree of individual learning and individual initiative is present in a knowledge-intensive project with high engineer-density. Typologies such as *learning by doing* and *learning by using* were found to be preferred by the members of the case project in every-day practice where learning was not the focal and conscious goal of the problem solving. The sociocultural learning perspective had a wide applicability in the case project, together with several theories related to the cognitive perspective. Several findings indicate that situated, practical, informal processes are acknowledged as the main path to learning in knowledge-intensive project organizations. Learning is something that, first and foremost, happens in the work situation itself. Though it seems evident that learning to a large extent is initiated at the individual level, findings indicate that learning is also largely initiated and developed at social arenas at the team level.

Members of the project were recognized by a high level of skill, self-efficacy and mastery, and were mainly driven by inner motivation. The members of the project also had a high degree of focus on problem-solving and the tasks at hand. All three learning mechanisms were found highly relevant to a knowledge-intensive project organization. However, learning systems and processes within experience accumulation and knowledge articulation were most used and appreciated by the members of the project, while the organization seemed to promote a higher focus on knowledge codification through governing documentation and knowledge management strategies implemented.

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## List of concepts and terms

**Learning -** *"[learning is] …any process that in living organisms leads to permanent capacity change and which is not solely due to biological maturation or ageing"* (Illeris, 2007). There are two fundamental processes of learning: *"… all learning implies the integration of two very different processes, namely an external interaction process between the learner and his or her social, cultural or material environment, and an internal psychological process of elaboration and acquisition"* (ibid).

**Learning arena:** Oxford dictionary online (2015) defines an arena as *"a place or scene of activity, debate or conflict".* Learning arenas are all arenas where learning takes place. The learning can be recognized as conscious, subconscious, experiential, formal, informal, individual, social/collective, operational or theoretical, all depending on the context of the learning and its actors.

**Learning processes -** All processes that lead to learning, both individual, collective and organizational processes (Filstad, 2010).

**Learning factors –** A factor is: *"A circumstance, fact, or influence that contributes to a result"* (Oxford dictionary online, 2015), the result here being learning. Learning factors can be aimed at all aspects of learning and learning processes, both individual, collective and organizational.

**Learning mechanisms –** Mechanisms through which organizations develop dynamic capabilities, defined as routinized activities directed to the development and adaption of operating routines (Zollo and Winter, 2001). Zollo and Winter (2001) recognize three learning mechanisms fundamental for developing DC. These three are *1) experience accumulation, 2) knowledge articulation and 3) knowledge codification.*

**Learning systems -** Organizational learning is a combination of individual, collective and organizational learning joined together in dynamic learning processes (Filstad, 2010). These learning processes are structured, formally or informally, in learning systems that organizations develop and maintain. These systems become a part of an organizations history and norms, and affect the way knowledge is transferred within the organization (Karlsen, 2013).

**Dynamic capabilities -** A dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness (Zollo and Winter, 2001).

**Project organization -** *"a temporary endeavor undertaken to create a unique product or service* (PMI, 2012). It also has a certain risk and uncertainty involved, and requires a level of resources; both human, material and financial (Smith, 2008). The project organization is the structural assembly of resources created to undertake the project and lead it to its success.

**Knowledge-intensive organizations -** Organizations that uses fairly sophisticated knowledge or knowledge-based products. The core of the activities are based on intellectual skills, and a large portion of the labor force have an academic background. A strong knowledge base and emphasis on competence development are also key factors. Four key factors are related to knowledge-intensive organizations (Alvesson, 2004):

1. Highly qualified individuals doing knowledge-based work, using intellectual and symbolic skills in work
2. A fairly high degree of autonomy and the downplaying of organizational hierarchy
3. The use of adaptable, ad hoc organizational forms
4. The need for extensive communication for coordination and problem-solving

**Tacit knowledge -** Knowledge always represents a tacit element that is peril for competent professional practice (Filstad, 2010). Tacit knowledge is anchored in practice and experience, in the action itself and its context and situation. This is why it is so hard to harvest and log tacit knowledge.

**Explicit knowledge –** The type of knowledge that can, for all means and purposes, be articulated, written down and transferred from one person to the next using a given code (e.g. language). By this, it is implicit that explicit knowledge is the only type of knowledge that can be made into information. This also implies that it is the type that can be digitalized (Filstad, 2010).

**Sociocultural Learning perspective -** The sociocultural learning perspective has three fundamental assumptions: Humans learn when they participate in knowledge processes, humans are active co-creators of knowledge and that knowledge is *changeable* (Manger et al., 2013a). A key perception within the sociocultural perspective is that humans learn when they work with knowledge in a social setting/context.

# Part 1 : Introduction

## 1 Introduction

### 1.1 Background

In the knowledge-economy of today, one should consider the human and knowledge capital as one of the most valuable assets for an organization. Because of this, learning should also be one of the core subjects for an organization (Johannesen and Olsen, 2008). Internationalization and globalization has contributed in making yesterday's knowledge outdated far quicker, thus boosting the need for constantly gaining new knowledge and setting it into system in the organization (Johannesen and Olsen, 2008). In response to an operating environment recognized by constant shifts, heterogeneity in tasks and a rapid technological development, the project-based organization structure has become increasingly popular (Smith, 2008, Karlsen, 2013). Projects, and their respective organization, have had to meet the demands of a growing complexity within technology, product and organizational change. One of the biggest advantages of projects are the ability to integrate knowledge and expertise from the different project members (Morris et al., 2011).

The increased focus on knowledge and learning has also contributed to the increased focus on theoretical areas such as knowledge management and dynamic capabilities. The framework for the thesis and ultimate goal of the processes being studied, is the creation of dynamic capabilities. Dynamic capabilities refer to an organization's ability to integrate, build and reconfigure its competences to make the organization better suited to adapt to rapidly changing environments (Teece et al., 1997). While research on the creation of dynamic capabilities is found to be quite extensive, most of the studies on dynamic capabilities focus on organizational issues and neglect the role of managers and other individuals (Eriksson, 2014). Also, studies on the emergence of dynamic capabilities only to a certain degree discuss which learning processes actually makes up the learning mechanisms identified. In a study based on a systematic synthesizing review of 142 articles on dynamic capabilities written by Taina Eriksson (2014), she recognizes the value of better understanding of how

projects could contribute to dynamic capability development from the managerial perspective.

Studies of organizational learning, learning in project organizations and theories on both organizational learning and dynamic capabilities are quite extensive. Yet, research on how learning processes and learning systems develop and are being used in a project organization from a sociocultural point of view is not a field where extensive studies have been done. Even less so in knowledge-intensive project organizations, which in the knowledge society today is used more and more because of the ever growing technological development. A focal perception within the sociocultural perspective is that humans learn when they work with knowledge in a social setting/context. In a sociocultural perspective the attention is turned both towards the individual and the social context of which the learning takes place (Svanberg and Wille, 2009). The workplace as a learning environment is strongly connected to the context and environment in which the learning takes place. In such contexts, informal learning is most prominent (Filstad, 2010). Even though a number of studies reveal that employees recognize the importance of informal learning, little attention has been devoted to uncovering what facilitates this type of learning. Therefore it is difficult for an employee to reveal what he/she has actually learned, and when this learning takes place (Filstad, 2010). This could lead to an increase in tacit, individual based knowledge rather than explicit, organizational knowledge.

## 1.2 Problem statement

This thesis seeks to explore and analyze the learning mechanisms that contribute in the creation of dynamic capabilities in a large and complex knowledge-intensive project organization. The study will do this by looking at the dynamic between social, individual and organizational processes for learning. The thesis will seek to gain knowledge on how learning processes develop and are used within the framework of the three learning mechanisms identified in Zollo and Winter (2001) in a knowledge-intensive development project.

With this in mind, the problem statement of this thesis will be as follows:

*"How are learning mechanisms used in the creation of an organization's dynamic capabilities in knowledge-intensive project organizations?"*

## 1.3 Research questions

According to Blaikie (2009), Research questions constitute the most important element of any research design. The research questions are an extension and elaboration of the problem statement, and express in clear text what the research is trying to achieve (Blaikie, 2009). In the process of working out the subject, methods and focus of this thesis, I have constructed three research questions, which are listed below:

1. *Which learning arenas and learning perspectives were most evident in the project?*
2. *What role plays individual learning in intra-project learning in knowledge-intensive organizations?*
3. *Which learning processes and learning systems can constitute the different learning mechanisms in knowledge-intensive project organizations?*

Two focal concepts in this thesis are *learning systems* and *learning arenas.* It is important to maintain a clear understanding of these two terms, therefore I choose to present their meaning at this point, thus forwarding a clear and unanimous understanding of the concepts. Learning systems are a combination of individual, collective and organizational learning joined together in dynamic learning processes (Filstad, 2010). These learning processes are structured, formally or informally, in learning systems that organizations develop and maintain. These systems become a part of an organizations history and norms, and affect the way knowledge is transferred within the organization (Karlsen, 2013). Learning arenas are all arenas where learning takes place. The learning can be recognized as conscious, subconscious, experiential, deliberate, formal, informal, individual, social/collective, operational or theoretical, all depending on the context of the learning and its actors. Thus, the term learning arenas are also closely linked to the sociocultural learning perspective by taking into account the context and situation of its social actors (Manger et al., 2013a)

## 1.4 Theoretical contributions of the thesis

The main contribution of the thesis is to forward a better understanding of how learning processes and learning systems in knowledge-intensive project organizations contribute in making up the three generic learning mechanisms identified by Zollo and Winter (2001). These three learning mechanisms are seen as vital in the creation of dynamic capabilities. The thesis will do this by creating a conceptual model based on a synthesis of relevant theory on the subject. The conceptual model depicts learning processes and learning systems thought to make up the three learning mechanisms *knowledge accumulation, knowledge articulation and knowledge codification.* The validity of the conceptual model will be explored through an analysis of empirical data, thus testing its practical validity. On the basis of this analysis, the conceptual model will either be upheld or changed to better fit empiricism. Through this, the learning systems and learning processes making up learning mechanisms in knowledge-intensive project organizations will be revealed, thus contributing to a better understanding of how the learning mechanisms contribute in the creation of dynamic capabilities.

## 1.5 Limitations and clarifications

To look at all aspects of individual learning, organizational learning and knowledge transfer would create a very shallow thesis and discussion. I have therefore chosen to limit my research to the project itself and only to a small degree discuss inter-project learning and how the knowledge is transferred from the project to the mother organization. The thesis will discuss how learning emerges in projects, and how the learning is set into system *in the project itself*. The subject of knowledge transfer from the project through strategies such as "lessons learned" are presented and discussed where it serves the purpose of showing the whole picture of learning systems. The link between intra-project learning and inter-project learning is very much present, and cannot be overlooked completely (Swan et al., 2010). This is recognized by the dynamic outline of the conceptual model of the thesis.

Learning theory generally, and organizational learning especially, have long had an individual focus, often dominated by the psychological and philosophical disciplines. Both learning and knowledge are widely discussed from a psychological, pedagogical, philosophical,

sociological and organizational point of view. At the same time, these disciplines have been held somewhat apart (Filstad, 2010). The work of such as Jarvis (2007) and Illeris (2007) have sought to shift the focus beyond the individual and beyond the single-disciplinary view, towards a social and interdisciplinary view on learning and knowledge (Jarvis, 2007 & Illeris, 2007 in Filstad, 2010). This thesis is founded upon these ideas. The theory presented and discussed takes an interdisciplinary approach, building upon theoretical work from philosophy, psychology, sociology, organizational theory and not the least pedagogy to construct a thorough theoretical framework. By taking an interdisciplinary approach to theory presented, it is important also to draw on theory from pedagogy when exploring the concept of learning. After all, pedagogy is the study of how we learn. Theory within pedagogy is largely written for the education sector. It is important to bear in mind that the education sector is recognized by a focus on formal learning, as well as a focus on learning among children and adolescents. It is a constructed environment with clear, formal rules (Filstad, 2010, Svanberg and Wille, 2009). In the workplace, informal learning has taken up more and more focus, where the learning is a byproduct of other activities. It is not structured of, or controlled by formal rules and goals. (Filstad, 2010). Therefore, when applying theory from pedagogy, it is important to keep in mind that this needs to be adapted to the context.

In the introduction to the thesis I presented research indicating that even though a number of studies reveal that employees recognize the importance of informal learning, little attention has been devoted to uncovering what facilitates this type of learning. Therefore it is difficult for an employee to reveal what he/she has actually learned, and when this learning takes place (Filstad, 2010). Individual learning and factors thought to greatly influence individual learning is a part of learning that has been given some extra attention in the thesis. This is also due to two main reasons. First, knowledge-intensive organizations are recognized by Alvesson (2004) as containing *"highly qualified individuals doing knowledge-based work, using intellectual and symbolic skills in work"* and *"a fairly high degree of autonomy and the downplaying of organizational hierarchy".* This, together with preliminary investigations into engineer-environments, substantiated a presumption that individual learning was extensively found in such environments. Engineer-environments are recognized by a high degree of problem-solving, presumptively often at the individual level. Second,

individual learning is still a focal part of the sociocultural learning perspective, even though learning is seen as something fundamentally social, situated and context-related.

Last, to discuss all aspects concerning Dynamic capabilities would lead to a less precise thesis, and would not the least lead the focus away from the main subject of this thesis. The thesis will therefore include the parts of dynamic capabilities that are linked to learning. The link between the learning processes and learning systems in a project organization and its implications on the dynamic capabilities of both the project and the mother organization have already been identified as a field of study in need of further research. To devote this link extra attention should be both valuable and very interesting. Within research on learning as an integral part of the dynamic capability process, Maurizio Zollo and Sidney Winter have made focal contributions. Their research on learning mechanisms are the stepping point of nearly all other theory on dynamic capabilities used in this thesis.

## 1.6 Outline

Part 2 presents relevant theory and earlier research on the subject of the thesis. Also, part 2 seeks to combine theory from the several disciplines, especially that of organizational theory, sociology, psychology and pedagogy. Part 3 will consist of a description of the methodical approach used in this thesis, discuss its strengths and weaknesses and will also discuss the validity and reliability of the thesis. Also, part 3 includes a chapter presenting the case project and its mother organization. In part 4, I will analyze the data collected through the case interviews and case observations. The part will start by analyzing the framework of the thesis, thus answering research question number 1. Then, by thoroughly analyzing the data collected up against presented theory, I will answer research question number 2 and 3. Part 5 will present the findings of this thesis. In addition, part 5 will conclude whether my theoretical model was a valid depiction of the learning systems found in the case project, and whether the model needs to be changed to better reflect reality as it appeared in the case findings. Last, part 5 will give suggestions to further research on the subject and comment on the theoretical and practical implications that the findings could have for the case organization and other related organizations.

# Part 2 : Theory

In this part, I will present theory and earlier research relevant for the subject, problem statement and research questions. I will begin with building the theoretical foundation for the thesis by presenting theory on dynamic capabilities and conceptions relating to dynamic capabilities. As earlier stated, dynamic capabilities are the goal, or purpose if you like, of the systemizing and developing of knowledge and learning that this thesis study. Therefore, dynamic capabilities are the framework and foundation of this thesis. In chapter 3 the fundamental terms of knowledge and learning are presented and discussed. Here I will first be presenting several relevant definitions for terms and conceptions used later in the thesis. Then I will present relevant theory affecting the phenomena studied. I will also present theory on individual learning, as stated in section 1.5 – *limitations and clarifications.*

Part 3 will culminate in the creation of the conceptual model on the phenomena that this thesis studies. Based on a synthesis of the theories presented in this thesis I have constructed a theoretical model illustrating what it thought to be important learning processes and learning systems behind the learning mechanisms in knowledge-intensive projects. This means that the model presented is constructed using the theory discussed below, though the model is not explicitly collected from one specific theory. The model serves as a graphical depiction of how I visualize the learning systems thought to be found in the case project. In addition, the model will be used to show learning processes and learning systems as a key factor in DC, by implementing several of the fundamental theories presented on DC, into the model. Both the model and this thesis will argue that DC is as much a part of learning as learning is a part of DC. Ultimately, the model and its discussion seeks to show how leaders can work simultaneously with both learning systems, learning factors and DC. The model will be thoroughly explored by analyzing empirical data in the context of the model, thus revealing whether it is valid in practice.

# 2 Dynamic capabilities and learning mechanisms

## 2.1 What are dynamic capabilities?

Dynamic capabilities (hereby referred to as DC) is a very broad and complex field of study, with a rich conceptual discussion base (Eriksson, 2014). It is considered an analytical tool that serves the purpose of uncovering whether an organization has the capacity to create, extend and modify its resource and capability bases in order to succeed in the future. It includes several processes, both internal and external. Also, theory on DC has had the tendency, especially in the recent years, to separate the DC from their antecedents and outcomes. With this DC includes not only the internal and external processes of creating the capabilities, but also its antecedents and outcomes (ibid).

To better understand what DC are, we should first look at the definitions of the two words *dynamic* and *capabilities.* The Oxford dictionary online (2015) defines the adjective *dynamic* as *"(Of a process or system) characterized by constant change, activity, or progress…*". Further, it defines capabilities (capability) as "*(often capabilities) the extent of someone's or something's ability*». By this, one can draw the conclusion that an organization's dynamic capabilities are the extent of an organization's abilities to change and to progress. This is still quite vague, because it does not say anything about why an organization should change, how it changes and what actually changes. Different researchers focus their research differently when it comes to DC. Some focus on the outputs/outcomes of dynamic capabilities, while other focus more on the development of DC with a focus on where they come from (Zollo and Winter, 2001). This thesis follows an ongoing project within a large organization, and thus does not study the result of the developed DC. Therefore, the latter focus is befitting of this thesis. Central to this focus are Zollo and Winter. Zollo & Winter (2001) defines dynamic capabilities as:

> *"A dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operation routines in pursuit of improved effectiveness"*

Learning and gaining of new knowledge needs to lead to something, it needs to have a purpose. This thesis studies learning processes and learning systems. The purpose, or goal,

of the learning and knowledge-gains from these processes and systems is in this thesis viewed to be the developing of dynamic capabilities. From Zollo and Winter's definition of dynamic capabilities, learning is the fundamental factor of developing such patterns of collective capabilities.

DC are routines and processes where resources are optimized and used in new ways. In the knowledge society of today, human and knowledge resources are of the outmost importance. Therefore, an important part of DC is to generate, modify and optimize knowledge-gaining and efficient use of human capital/resources. Further, DC consist of systematic strategic processes and decision making as well as routines for production (Eisenhardt and Martin, 2000). DC are as much a critique of the resource based view as it is an extension of it. The resource based view (RBV) is a theoretical framework that focuses on how competitive advantage is achieved and how it is sustained over time by focusing on how an organization best makes use of its limited resources. Also, theories within this framework focus on so-called VRIN-attributes – whether the resources are valuable, rare, inimitable and non-substitutable. The problem arises when this framework is applied to dynamic environments, because earlier theories within RBV tend to be reliant on the fact that resource differences are somewhat persistent. Also, the manipulation of knowledge resources is recognized as vital in dynamic markets, but not adequately explained using the traditional theories within RBV (Eisenhardt and Martin, 2000). Theories on DC is therefore an extension of RBV because DC still focuses on how an organization utilizes its resources, but shifts focus from static, lasting competitive advantage to a focus on competitive advantage as more temporary and unpredictable. On the one hand, researchers argue that DC focuses on the ability to integrate, reconfigure, gain and release resources in order to adapt to change in the organization's environment (ibid). Zollo and Winter (2001) on the other hand, describe DC as a process of research, restructuring and integration/routinizing. The discussion of these two approaches lies outside the scope of this thesis. Both focus on creating, developing and integrating resources, and this thesis limits itself in studying the learning aspect of how DC emerges and develops.

Because the emergence, modification and integration of human resources are crucial in developing DC, learning is also vital. Zollo and Winter state that DC arise from learning, therefore they developed three fundamental mechanisms involved in the creation and evolution of DC (ibid). These learning mechanisms need to be further presented. This is done in the next section.

## 2.2 Inside the black box of dynamic capabilities creation and development

### *2.2.1 Learning mechanisms*

Zollo and Winter (2001) recognize three learning mechanisms fundamental for developing DC. These three are *1) experience accumulation, 2) knowledge articulation* and *3) knowledge codification*. *Experience accumulation* is recognized by a quasi-automatic process that involves accumulating knowledge through experience, while *knowledge articulation* includes more deliberate and conscious learning either individually or collectively. *Knowledge codification* involves codifying articulated knowledge into written or recorded tools such as manuals, drawings, instructional videos, management systems, databases, written assessments and knowledge transfer tools (Zollo and Winter, 2001). An organization is not in need of all three mechanisms in order to develop DC, but neither 2 nor 3 can be taken into use without the preceding mechanism. For instance, it is not possible to facilitate knowledge codification without first accumulating and articulating the knowledge that is being codified.

The three learning mechanisms are a fundamental framework for the theoretical field of knowledge management, where especially knowledge codification is of importance (Prencipe and Tell, 2001). The three mechanisms will also serve as a framework for all learning in project organizations discussed in this thesis, and theories on learning and knowledge will, explicitly or implicitly, be linked to the mechanisms. Each mechanism involves a set of learning typologies and/or strategies connected to a set of outcomes. They are therefore suited for different organizational contexts, according to the challenges and opportunities that an organization is facing. In environments where the task is recognized by a high frequency and low heterogeneity, experience accumulation can be more than sufficient. When the frequency of the task decreases and the heterogeneity increases

knowledge articulation and knowledge codification are better suited as learning mechanisms. This is argued to be the case for project-based firms (Prencipe and Tell, 2001).

Prencipe and Tell (2001) have made an overview of the typologies and outcomes of each learning mechanism, which is shown in table 4.1. Some elements have been added to their table based on the presentation below. The added elements are italicized. Each learning mechanism is presented and discussed below, but will also be discussed in depth throughout all sections of this thesis, thus underlining its role as a framework for learning in project organizations.

| | **Learning *mechanisms*** | | |
|---|---|---|---|
| | Experience accumulation | Knowledge articulation | Knowledge codification |
| **Learning typologies** | • Learning by doing<br>• Learning by using | • Learning by reflecting<br>• Learning by thinking<br>• Learning by discussing<br>• Learning by confronting | • Learning by writing and re-writing<br>• Learning by implementing<br>• Learning by replicating<br>• Learning by adapting |
| **Outcomes** | • Local experts and experiental knowledge in individuals (e.g subject-matter expert) | • Symbolic representations and communication<br>• Improved understanding of action-performance relation | • Codified manuals, procedures, *assessments, knowledge-transfer tools and other written or recorded tools* (e.g project management process) |

*Table 2.1 – Learning typologies and outcomes of the three learning mechanisms*

*Experience accumulation* is recognized by a quasi-automatic process that involves accumulating knowledge through experience. It is the process where an organization seeks to change or improve its operating routines by building on experience and tacit knowledge existing in the organization. Learning within this mechanism is experiential, and relies on the organization's "trial and error". Learning develops as – and through – experience and tacit knowledge. Improvements can take time, but in a relatively stable environment, incremental improvements could be enough to constantly stay ahead of the competition. Even more, stable operating routines could be what actually makes an organization keep its competitive advantage (Zollo and Winter, 2001). Experience accumulation has the perceived lowest investment in learning and development of DC, because the monetary and time-related investment is relatively low from an organizational perspective (Zollo and Winter, 2001). In dynamic and unpredictable environments on the other hand, semi-automatic processes and tacit accumulation of experience would not be enough to develop functional DC. Operating routines need to be updated regularly, as new knowledge is obtained and/or made accessible to the organization (Zollo and Winter, 2001). For this to happen, one is in need of a learning mechanism that includes deliberate and conscious learning.

*Knowledge articulation* is recognized as a learning mechanism that includes more deliberate and conscious learning. In the process of knowledge articulation, the members of an organization deliberately seek arenas where they together or individually can figure out what works and what doesn't (ibid). In such arenas, tacit knowledge is articulated by the members of the organization through cognitive processes at individual or group level. The learning mechanism is first and foremost carried out on learning arenas such as collective discussions, debriefing sessions, team work and evaluation processes, but can also occur on the individual level. Articulation of knowledge can occur in the context of experiential learning, but will then require a higher level of reflection and conscious cognitive processes (Prencipe and Tell, 2001). When working with the articulation process in groups, the goal is to build collective competence through sharing individual experience and tacit knowledge. The learning typologies involved are then primarily learning by discussing and learning by confronting. These articulation efforts have the potential of turning tacit, experiential knowledge (as well as individually articulated knowledge) into explicit knowledge, though it

is important to note that some tacit knowledge will always remain tacit. Not all potentially articulable knowledge will turn into articulated statements. Tacit and explicit knowledge will be further discussed in section 3.1.1. When applying knowledge articulation processes, the perceived investment in learning and development will be higher than when counting on experience accumulation. Costs related to time used will be the focal factor, and organizations should therefore assess their environment, culture, structure and need before consciously facilitating knowledge articulation processes.

The third learning mechanism is *knowledge codification*. Knowledge codification is a step beyond knowledge articulation, and involves codifying articulated knowledge into written or recorded tools such as manuals, drawings, instructional videos, management systems, databases, written assessments and knowledge transfer tools. Today these tools are mainly digital, with a vast amount of solutions available. The codification process can be seen as the process of turning knowledge back into objectified information. Since the knowledge codification process relies on tacit knowledge being made explicit, the debate on when, or whether tacit knowledge should (or could) be made explicit, is very much relevant in a discussion about knowledge codification (Prencipe and Tell, 2001).

Knowledge codification is time consuming and the initial costs are high, but especially recently researchers have argued that the benefits of high quality formalization produces synergies that could more than offset the initial costs (Prencipe and Tell, 2001, Zollo and Winter, 2001). Whether the synergies of formalization/codification of knowledge is great enough to justify the resources (primarily time and money) put into the process is a long and still ongoing debate, also partly fused by the fact that in most cases articulated knowledge isn't codified (ibid). This underlines the argument that the step from articulation of knowledge to codification of knowledge is greater than from experience accumulation to knowledge articulation. Still, when applying knowledge codification processes this denotes a high investment in learning and development of DC.

An important potential downfall when using resources on knowledge codification is that employees don't use the manuals and documentation created. They simply go through the

process of codifying because they are told to do so, not taking into account that the codified material also needs to be taken into use for the initial costs to pay off. This is a leader responsibility, where the middle management is of outmost importance. Researchers mostly agree that middle management in some cases can have more actual influence on the employees than top management, and have a high degree of both formal and informal influence on the employees (Filstad, 2013, Folkestad, 2010). They are therefore also crucial in both knowledge articulation and knowledge codification processes, especially in the role as facilitator and motivator. The same goes for processes of editing, rewriting and using codified material, thus making the codified material into "live documents" and harvesting the potential that lies in utilizing this learning mechanism.

Knowledge codification also has the potential to bring learning by itself because by producing, editing and updating codified material there is a potential of gaining a higher understanding of the material in question. One should therefore not just look at knowledge codification as something one does at the end of a learning process or when knowledge is transferred from one project to another. When codifying articulated knowledge, the individual or group performing the coding will have to reflect on what works and what doesn't. This can in return facilitate the generation of new ideas and better, more efficient solutions. "*Codification, therefore, is potentially important as a supporting mechanism for the entire knowledge evolution process, not just the transfer phase (Zollo and Winter, 2001).* Important questions to reflect upon when working with knowledge codification could be: Have we sufficiently justified the codification process? Are the employees motivated and do they see the necessity of codifying the knowledge? Will the codified material be taken into use at a later stage? Are the systems for harvesting, editing and using the codified material sufficiently implemented in the organization? These questions will be further discussed and elaborated in part 4.

### *2.2.2 Two knowledge-management strategies*

Given the discussion in the preceding section, all three learning mechanisms are a process of learning. These processes are a part of a project organization's intra-project learning, the project based learning that precedes (and is intertwined into) inter-project learning (Swan et al., 2010). Swan (2010) underlines the importance of linking intra-project learning to inter-project learning when studying project-based learning. When assessing the framework of learning processes in an organization, a short introduction to knowledge management strategies are helpful. Prencipe and Tell (2001) argue that organizations follow two main types of knowledge management-strategies. These are the personalization strategy and the codification strategy. A personalization strategy involves a large degree of individual, cognitive learning, where the knowledge is closely tied to the person who developed it. Knowledge sharing is mainly performed through direct person-to-person contact. A codification strategy involves written and/or recorded material, where knowledge is codified and stored in databases in order to make it available to the whole company and thus create a collective knowledge base (ibid). One strategy is not defined better than the other, but rather as extremities on either side of the scale. When analyzing how an organization facilitates learning, a short analysis of the knowledge management-strategies implemented are a valuable framework. These will therefore undergo a short analysis in part 4.

# 3 Knowledge and Learning

## 3.1 What is knowledge?

The concept of knowledge is covered by a vast number of definitions and perceptions about what knowledge actually is. It is important to recognize knowledge as the complex concept that it is. At the same time one needs to recognize the concept in its given context (Filstad, 2010). Philosophy, psychology, pedagogy and sociology will all have their definitions on what knowledge is, all varying slightly according to context. Knowledge is often simplified to equal information and statistics. This leaves out both the situation, context, coding and the social relations that all affect how knowledge is perceived (Schneider, 2007 in Filstad, 2010).

Johannessen & Olsen (2008) defines knowledge as "*systematization and structuration of information for one or several purposes*" (trans). Information needs to pass through several

filters and undergo actions in order to turn into knowledge. By this, one separates knowledge as information when it is not used through action, and knowledge and competence when it is used through action (Baets, 2006 in Filstad, 2010. Information is not knowledge until it, in the process of action and development, is combined with experience, context, understanding and reflection (Filstad, 2010). From this, knowledge can be defined as *the ability to act.* This definition is anchored within cognitive psychology, and understands knowledge as information combined with interpretation, reflection and context (ibid). In this, there is also an understanding that knowledge can be made explicit by consciously transforming it between knowledge and information. It is important to look at knowledge not only it its explicit form, but also recognize its tacit dimension. These types of knowledge will be further elaborated in the following section.

### *3.1.1 Two main types of knowledge*

When talking about knowledge, one usually talks about two types of knowledge – tacit and explicit knowledge. These two dimensions serve different purposes in the process of obtaining, utilizing and distributing knowledge. Explicit knowledge is transferred between people using coding and decoding skills such as language, symbols and numbers. It is simply the type of knowledge that can, for all means and purposes, be written down and transferred from one person to the next. By this, it is implicit that explicit knowledge is the only type of knowledge that can be made into information. This also implies that it is the type that can be digitalized (Filstad, 2010). When an organization aspires to transfer obtained knowledge via knowledge systems such as Lessons Learned, it is therefore vital that the knowledge is made explicit before the process of transfer takes place. The process of making tacit knowledge explicit is in accordance with the learning mechanism *knowledge articulation*. Social learning arenas where typologies such as reflecting, discussing, sharing and confronting are key factors contributing to articulating knowledge. The articulated knowledge can then be written down, or codified, through typologies found in the knowledge codification process. The link between tacit and explicit knowledge and these two learning mechanisms are further elaborated in the presentation on the SECI-model.

#### *3.1.1.1 Tacit knowledge*

The term tacit knowledge was first introduced by Michael Polanyi in his book "The Tacit Dimension" written in 1966. In this book he writes "*I shall reconsider human knowledge by starting from the fact that we can know more than we can tell".* His chief example was that we can recognize a face among millions of people, but we cannot accurately enough describe the face to others so that they can do the same. Some of the knowledge that we possess is lost in translation. Knowledge always represents a tacit element that is peril for competent professional practice (Filstad, 2010).

Tacit knowledge is anchored in practice and experience, in the action itself and its context and situation. This is why it is so hard to harvest and log tacit knowledge. Its form and being requires alternative ways of teaching tacit knowledge to others. A combination of explanation and at the same time being able to show what is being taught, is a good way of learning tacit knowledge to others (ibid). Learning-by-doing is a maxim much used when talking about learning, and also a typology found in both experience accumulation and the behavioral learning perspective discussed in the next chapter. Learning-by-doing, combined with guidance and support of an individual that possesses the tacit knowledge, is key factors in transferring tacit knowledge. Polanyi supports this by claiming that tacit knowledge is learning through action. The person wanting to learn the tacit knowledge needs to practice it himself/herself (Polanyi, 1966). Thus, tacit knowledge is a vital element in experience accumulation. Individual experience is accumulated into organizational routines and individual know-how, but is also made possible to transfer between individuals through action and person-to-person contact.

### *3.1.2 The SECI-model*

A separation of explicit and tacit knowledge is a modeled and constructed separation for theoretical purposes. In practice, these two types of knowledge blends together, making it even harder to communicate tacit knowledge (Filstad, 2010). Nonaka and Takeuchi (Nonaka et. al, 2000 in Filstad, 2010) have constructed a much used model depicting their view of how tacit and explicit knowledge interacts in a process of knowledge-making. The model is called the SECI-model, which is an abbreviation for socializing, externalizing, combining and internalizing. The model is shown in figure 3.1.

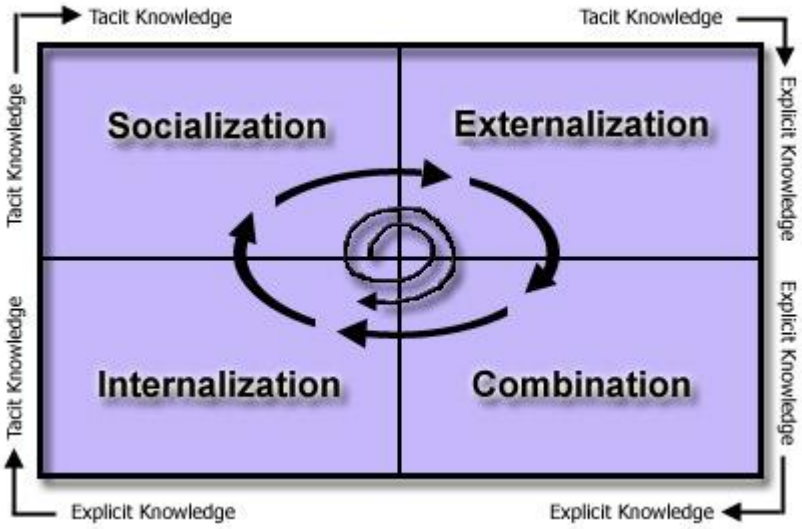



*Figure 3.1 (Gram, 2009)*

New knowledge is created through socializing, where individuals interact with each other in developing new tacit knowledge within each individual. The tacit knowledge here created is individual-based and formed by each individual's experience and understanding of context (Filstad, 2010). The socializing phase is related to the learning mechanism *experience accumulation.* The result of the socializing-phase is communicated to others through externalizing, thus making the tacit knowledge explicit. This phase is crucial in transferring knowledge through social learning arenas and thus in establishing dynamic capabilities, because knowledge is articulated and shared between the individuals in the group. Therefore, externalizing is in accordance with knowledge articulation. When the knowledge has been made explicit, it is combined with other explicit knowledge, thus developing new knowledge. This is then internalized by the individuals, making the explicit knowledge tacit again. Also, the externalized and combined knowledge can be codified using knowledge codification processes. The sought goal is then to keep the knowledge explicit and thus available to the greater part of the organization. The continuous interaction between tacit and explicit knowledge is essential in the creation of knowledge, shown by the spiral in the model.

The externalizing-process is viewed as the hardest part of the process, and is also the part of the model that has undergone most critique (Filstad, 2010). Much of the critique lays in the fact that in Polanyi's interpretation of tacit knowledge, there is an understanding that tacit knowledge cannot be "captured", transferred or converted, only made visible through our actions (Tsoukas, 2003 in Filstad, 2010). Tsoukas claims that tacit knowledge is a part of explicit knowledge, and vice versa. This means that one should not try to operationalize tacit

knowledge, because by finding new ways to communicate knowledge, both dimensions can be transferred. This thesis takes this critique into account, and shares the view of Tsoukas to a certain degree. The SECI-model is a very simplified way of looking at the process of creating knowledge, but it is just that – a model simplifying reality. Instead of discussing the nature of tacit knowledge, this thesis acknowledges that it exists. From that stance, I will make an argument of how tacit knowledge best can be communicated, making it a vital part of the learning system of the organization. This is relevant to both the knowledge articulation and knowledge codification process of DC defined by Zollo and Winter and further investigated by Prencipe and Tell (Zollo and Winter, 2001, Prencipe and Tell, 2001).

## 3.2 Learning

This chapter will discuss the concept of learning and the three most widely used perspectives on learning. As earlier mentioned, this thesis is founded upon the sociocultural learning perspective. The perspective have gained much acknowledgement within organizational learning theory, knowledge management and theory on intra-project and inter-project learning (Filstad, 2010, Swan et al., 2010). At the same time, a focus on the sociocultural perspective as relevant for project-based learning has been criticized for not sufficiently taking into consideration the temporary, fluid, time-bound nature of project work (Swan et al., 2010). This critique is not taken for granted, and is both presented and discussed in section 3.2.3.

### *3.2.1 What is learning?*

Jacobsen and Thorsvik have defined learning as *"a process where people and organizations gains new knowledge and changes their behavior based on this knowledge"* (trans.) (Jacobsen and Thorsvik, 2011). This definition is supported by a widely used definition of learning, stating that "*Learning is a relatively permanent change in behavior as a result of practice or experience"* (trans.) (Svanberg and Wille, 2009). Both definitions assume that a change in behavior has to take place in order to call it learning. This indicates that it is not enough merely to "keep the knowledge in our heads" and thereby say that we have learned. The learned knowledge also needs to be taken into use, and change our behavioral patterns. This point is in accordance with the definition on *knowledge* presented in the last chapter.

What is not clear from these definitions is that learning is a result of our interaction with our surroundings. Either the artefacts that we use in order to learn and/or the social context in which the learning takes place will also affect learning.

Knud Illeris (2007) gives a third definition of learning, also similar to the two preceeding definitions: "*[learning is] …any process that in living organisms leads to permanent capacity change and which is not solely due to biological maturation or ageing".* This definition is even broader and more general than that of Jacobsen and Thorsvik and Svanberg and Wille. Illeris makes a point that there are two fundamental processes of learning:

> *"The first important condition to realise is that all learning implies the integration of two very different processes, namely an external interaction process between the learner and his or her social, cultural or material environment, and an internal psychological process of elaboration and acquisition (ibid)."*

With this in mind, this thesis will rely on both Illeris' definition and his point on the basic factors of learning. Filstad (2010) also supports Illeris' view of two basic factors of learning – one internal and one external. Her argument strongly supports the view that context and the individual's interaction with its surroundings is crucial for our description and understanding of the concept of learning.

### *3.2.2 Different perspectives on learning*

Throughout history different perspectives on learning have been dominant in learning theory. Three perspectives have especially stood out. These three perspectives are the behavioral perspective, the cognitive perspective and the sociocultural perspective (Manger et al., 2013a, Svanberg and Wille, 2009). Common for all perspectives is that they all try to explain the essence of learning. When observing how learning takes place in the case project, there is reason to believe that the learning will draw on elements from all three perspectives, all depending on context and purpose (Svanberg and Wille, 2009).

#### *3.2.2.1 The behavioral perspective*

The most dominant principle within the behavioral perspective is that we learn as a result of the consequences of our actions. The definition of learning given by Svanberg and Wille primarily stems from the behavioral perspective, where one studies behavior and change of behavior. Its founding field is the field of psychology, and the main focus was to observe what influences the individual, and which behavior that followed the influence. The influence is labelled stimuli and the reaction is labelled the response (Svanberg and Wille, 2009). Behavior should be looked upon as relationally and contextually determined. In almost every educational and work-situation, behavioral psychology is practiced either consciously or subconsciously. We all affect each other's behavior through interaction with each other, one way or another (Manger et al., 2013a). By this, the behavioral perspective is also the perspective and theories on learning most closely related to experience accumulation. This learning mechanism draws much of its theoretical base from the behavioral perspective, though I will argue that this is mainly as a part of a larger framework – the sociocultural perspective.

Reinforcement is the event succeeding an action, and is a key concept in the behavioral perspective. It is something that makes the individual continue its endeavor, and is defined as any consequence of an action that increases the probability that an action is repeated (ibid). A project manager (or any other person/group controlling and/or influencing the learning process) can make use of both positive and negative reinforcement. In an organization most (if not all) of the employees automatically have a reinforcement by being paid for what they do. Bonuses on top of this can be an example of a positive reinforcement (if you work hard, you get a bonus), but can also be a negative reinforcement if the bonus is "always" given if you put in your usual effort (if you do not do your best, you will lose your bonus this year).

#### *3.2.2.2 The cognitive perspective*

While behavioral theory excludes "the inner self" of the individual because it cannot be measured or researched, the cognitive perspective sees the inner mental processes as central to learning. One often calls this perspective the cognitive constructivist perspective,

meaning that it focuses on how we understand, develop and construct our concepts and our knowledge. We construct our knowledge not by looking at bits and pieces one by one, but by seeing things in context, understanding and interpreting them (Svanberg and Wille, 2009). The main contributor within the cognitive perspective is undoubtedly Jean Piaget. Piaget looked at learning as a process of developing and expanding cognitive structures developed at the individual level. This process of adapting one's cognitive structures is recognized by assimilation and accommodation. When being faced with new knowledge, the individual will assimilate the knowledge into existing cognitive structures, and through accommodation these structures are changed to include the new experiences (Svanberg and Wille, 2009). Theories from the cognitive perspective are relevant to both experience accumulation (individual learning) and knowledge articulation processes, but most of all it is relevant to the processes *in between* these two mechanisms. Also, the theories from this perspective are closely related to the combination and especially internalization phase of the SECI-model. Learning at the individual level is also an integrated part of all learning, because one cannot remove the individual reflection processes related to learning, even though they are not isolated from context and social factors.

The cognitive perspective has been further developed, especially from the late 90s. In 1997 Albert Bandura developed the social-cognitive perspective, which describes learning in a mutual interaction between behavior, environment/context and personal factors. The personal factor of self-efficacy is fundamental in this perspective. Those who expect to succeed work harder, are more persistent and will ultimately perform far better than those who doubt their ability to succeed (Svanberg and Wille, 2009). This perspective is focal to theories on motivation and mastery, and will be further elaborated in the section on individual learning.

### *3.2.3 Sociocultural learning perspective*

The sociocultural learning perspective is a perspective of many names. It is called both the situative, situated, sociohistoric and sociocultural perspective. All names deal with the same theories, and they can therefore be looked upon as synonyms. In this thesis, I will use the term *sociocultural perspective*.

In the later decades, the sociocultural learning perspective has been dominant in the Norwegian education sector. It is also very much present in organizational theory and knowledge management theory (Filstad, 2010, Swan et al., 2010). The sociocultural learning perspective has three fundamental assumptions. The first is that humans learn when they participate in knowledge processes. "Learning by doing" is an example of this assumption, which is largely drawn from the theories of John Dewey and the behavioral perspective. Dewey thought that knowledge was created through practical activities, where people participate to solve problems together (Svanberg and Wille, 2009). Thus, this assumption also relates to both the behavioral perspective and experience accumulation. The second assumption is that humans are active co-creators of knowledge. This assumption can relate to experience accumulation, where person-to-person-contact is central and collective, social knowledge articulation processes. It can even relate to codification processes, realized through typologies such as learning by writing and re-writing and learning by adapting, because these processes are often done collectively rather than by one single person.

The sociocultural learning arenas thought to initiate learning, as well as arenas for articulating knowledge, is important arenas where employees participate in social co-creation of knowledge. Third, is an assumption that knowledge is *changeable* (Manger et al., 2013a). A key perception within the sociocultural perspective is that humans learn when they work with knowledge in a social setting/context. Human activity, dialogue and interaction are central elements, meaning that this theory also is relevant when project-based structures are chosen as work-form. Within this perspective, the project manager plays a very important role in facilitating functional settings for learning. It is not merely enough to place people in the same room and expect them to learn. The social setting needs to be *facilitated,* and support structures need to be in place. Examples of such structures are a clear and understandable task description, clear goals, common understanding of the task at hand, guidance, and support during the process and immediate feedback during and after the task. The support structures can be realized for instance through the project manager, mentors and codified material. A crucial competence for the project manager is therefore knowing how he or she can organize functional social arenas for learning which invites the participants to work in ways that allow them to learn from each other (Manger et al.,

2013a). This is shown as the first element of the conceptual model – sociocultural learning arenas.

The Russian psychologist Lev Vygotsky is the most influential researcher within the sociocultural perspective. Vygotsky stated that people were dependent of a social environment in order to develop and learn. The experiences from these social environments would then be conveyed through language. Language, according to Vygotsky, was a social phenomenon, and of outmost importance (Svanberg and Wille, 2009). Vygotsky also developed the concept of *"the zone of proximal development".* He defined the zone as "the distance between what an individual can perform on his/her own without support, and what the individual can perform with help from another more qualified person"(trans.). This zone is shown in figure 3.2 as "nærmeste utviklingssone".


*Figure 3.2 – Zone of proximal development (Säljö, 2001 in Svanberg and Wille, 2009)*

According to Vygotsky, learners should be encouraged to work with what they almost could do, rather than always working with what they already knew. In this process, guidance and feedback from a person more competent on the task at hand was essential. This leads to achievement/mastery and expanding the limits of our zone of proximal development.

A common misunderstanding is that sociocultural theories on learning is separated from the cognitive, individual based theories and only focuses on the social. This is not the case. In a sociocultural perspective the attention is turned both towards the individual and the social context of which the learning takes place (Svanberg and Wille, 2009). Olga Dysthe (2001, in Svanberg and Wille, 2009) has listed six points summing up learning within the sociocultural perspective:

- Learning is situated
- Learning is fundamentally social
- Learning is distributed
- Learning is mediated
- Language is essential in learning processes
- Learning is participating in communities of practice (hereby referred to as CoP)

Situated learning indicates that learning is a part of the individual's every day practice. Individuals exist in social contexts – in a network of social relations. These relations help define what we can or can't do – what we can or can't learn. Both the fact that learning is social and that learning is distributed has already been discussed, while mediation needs to be explained. That learning is mediated means that learning is conveyed, or transferred through an individual's context with the help of tools that make us able to understand what is being conveyed. These mediating tools make it possible for us to interpret the world around us (Manger et al., 2013a).

The last of Dysthe's point is both a very interesting and a controversial point in the context of this thesis. CoP is a term closely connected to *situated learning*. No learning happens in "empty space", all learning is situated in CoP. These communities are found everywhere, and an individual is a member of many different communities. In every community that a person is a part of he/she has different positions, for instance at work, at home and with friends. In some CoP we are merely apprentices participating in the outskirts of the CoP, while in other communities we are full-worthy members sharing our own expertise. Also, in the workplace we take part in different CoP every day. Each community is recognized by its informal group structure. These groups have formed as a result of an experience of affiliation (Svanberg and Wille, 2009, Filstad, 2010). A community of practice can be defined as *"a group of people sharing a concern, a set of problems or enthusiasm for a given subject and that develop knowledge and expertise on that particular area of interest through lasting interaction"* (trans.) Wenger et al. (2002 in Filstad, 2010). Each CoP can be said to represent a learning arena. The potential of informal learning is such arenas are huge, but if they are not recognized and trust and identities within the CoP are not developed, its collective capacity

and potential as learning arena will quickly be reduced. In the creation and development of CoP, knowledge articulation processes are important to learning. A key factor is to not formalize CoP *if* the goal is to promote informal learning. Why try to formalize something that is of an informal nature? (Filstad, 2010)

#### *3.2.3.1 Sociocultural perspective and its relevance in project organizations*

Vygotsky meant that development of learning moves from the social and collective towards the individual and cognitive. Actions emerge in social interaction, and are then internalized by the individual. By this, there is a notion that problems that we need help solving, we then internalize and eventually will be able to solve by ourselves cognitively (Svanberg and Wille, 2009). This is supported by Manger et. al (2013a), who states that:

> *"A fundamental insight within sociocultural theory is that we learn together with others so that we can continue to learn alone, and in turn be better equipped to participate in the social community of learning yet again … When we have done something together, we work independently with the teaching material until it is a part of our intellectual knowledge database. When we have learned by ourselves, we also become better at learning more together (trans.)."*

Even though this is written with the education sector in mind, it can be transferred to our context. The teaching material can be any sort of new knowledge obtained from the social community where the learning took place. This quote, along with Vygotsky's ideas, reveals the main message of this thesis' conceptual model, presented in chapter 6. Learning goes *from* the social *to* the individual level. It is then brought back to the social level either directly or via learning mechanisms, systematization and as an incorporated part of an organization's learning systems. This is shown in the conceptual model both by the two-way arrow between sociocultural learning arenas and individual learning, and by the model as a whole. The two-way arrow shows that what is learned in the sociocultural learning arena builds a foundation for individual learning, but that individual learning also builds the foundation for learning in the sociocultural learning arena.

#### *3.2.3.2 Critique against the sociocultural learning perspective in the context of project-based learning*

The critique against applying the sociocultural learning perspective to project-based learning is first and foremost founded upon two arguments. The first is that project learning and team learning have different characteristics, especially when it comes to time, frequency and heterogeneity of tasks, stable membership, shared goals, psychological safety and mutual trust (Swan et al., 2010). The second is that theory on CoP is not easily applied to projects, because projects typically "*lack the community-building effects found in localized, ongoing and more routine work activities* (Gherardi et al., 1998, in Swan et al., 2010). Thus, the *lasting interaction* of the definition of CoP is a subject of debate in the context of project-based learning. Swan et al. (Swan et al., 2010) states that:

> *"… there is a need to theorise project-based learning in its own right, as distinct from team learning … the individuals [in projects] involved do not necessarily see themselves as part of a (psychological) team, and group goals, mutual interests and common understanding do not develop because there is no shared practice that unites project team members."*

By looking at these two arguments, it is revealed that both include two fundamental elements – time and community-building effects (or rather the lack of community-building effects). Swan et al. (2010) states that the relevance of the situated perspective (ref. sociocultural perspective) is diminished to the extent that projects brings together individuals from a variety of different existing CoP and social groupings. By taking Dysthe's list of characteristics into consideration, this seems somewhat generalized. The sociocultural perspective should be viewed as more than embodied through CoP and team work. At the same time, the characteristics of projects vary greatly according to organization, culture, social setting, operational sector and so forth. Thus, an analysis of the context and structure of the project in terms of factors mentioned in the critique from Swan et al. (2010) is important. During the data collection, I will therefore also make sure to collect sufficient data to analyze factors mentioned in the critique here put forward, and then present a conclusion as to whether it is valid to apply the sociocultural learning perspective to projects such as the case project or not.

### *3.2.4 Individual learning*

In addition to arguments presented by Filstad (2010) in section 1.1 – *Background,* this thesis motivates a somewhat elevated focus on individual learning based on two main reasons. First, both knowledge-intensive organizations and engineer-environments have shown signs of a, presumptively, heightened focus on individual learning and problem-solving, motivating a further analysis whether these presumptions can be supported empirically. Second, individual learning is still a focal part of the sociocultural learning perspective, even though learning is seen as something fundamentally social, situated and context-related. The problem arises when the individual learning never reaches the point where the learning is systematized. This results in tacit knowledge, stored in each individual. Individual learning is, by this perspective, very much of importance. No organization can develop collective/organizational knowledge if the individual learning is not stimulated and promoted. The project manager and department leaders/middle manager (hereby referred to as middle manager) also play a crucial role within individual learning not only as leaders, but also as motivators, mentors, coaches and facilitators (Brenner, 2007). Leaders have a responsibility when it comes to facilitating and promoting achievement among their employees.

#### *3.2.4.1 Mastery and self-efficacy*

To achieve something presupposes that one is able to master it. A definition of mastery is

> *"to be able to perform and accomplish it in a way that is perceived satisfactory for you and/or other people through a set of standards, and that makes it possible to reach particular goals perceived as valuable (Svare and Klemsdal, 2011, Johannesen and Olsen, 2008)."*

A famous Henry Ford quote is *"Whether you think you can, or you think you can't--you're right."* This underlines the importance of believing in oneself when the aim is to accomplish something. A popular term used for self-belief is *self-efficacy,* which is a key concept of social cognitive learning theory developed by Albert Bandura in the 1990's (Svanberg and Wille, 2009). Central ideas within the concept of self-efficacy is that those who expect to succeed work harder, are more persistent and will ultimately perform far better than those who doubt their ability to succeed (ibid). The belief we have in our own capacity to master tasks

decide what we do with the ability, knowledge and skills that we possess. Self-efficacy develops through continuous mastery of tasks in environments where other people are important participants as mentors. Therefore, self-efficacy is also closely related to mastery within the zone of proximal development. While a person with low self-efficacy would remain passive, waiting for others to take responsibility, or hoping that the problem will disappear on its own, a person with a high degree of self-efficacy would perform more actively towards the challenge.

> *"Typical for a person with a high degree of self-efficacy is also that he seeks to learn from the challenges he faces and the errors he does, so that he is better equipped to succeed next time (trans.) (Svare and Klemsdal, 2011)".*

Thus, self-efficacy is closely related to the realization of experience accumulation processes, because processes within this learning mechanism presupposes active intervention from the individuals in the organization. Experience accumulation is action-related, where individuals learn by working with tasks. A high degree of self-efficacy among the members of the organization should promote experience accumulation processes, but there is reason to believe that it also has positive synergy effects for the other learning mechanisms.

#### *3.2.4.2 Motivation*

> *"Motivation is a key influencer of behavior and it helps maintain a high level of commitment to project goals (Bernard Pinheiro, 2010)."*

Filstad (2010) states that emotions and motivation is always a part of the learning process and affects the outcome of the learning process. Motivated individuals connect new knowledge to their existing knowledge database. Instead of giving up when they are faced with a problem or obstacle, they increase their effort and find new ways of solving the problem. Thus, motivation is also a focal factor of self-efficacy. Motivation can stem from inner motivation, outer motivation or a combination of the two (Manger et al., 2013b).

On a general basis, inner and outer motivation are separated on the basis of *why* we perform the action/task/process (hereby referred to as action). *Inner motivation* denotes a dedication to the action because the individual finds joy and satisfaction in the action itself.

Personal development can also be a sought result of inner motivation. The individual engages in the action because they wish to, not because of factors outside the sphere of the action itself. *Outer motivation*, on the other hand, are the factors outside the sphere of the action itself. We engage in the action as a means to reach a desired goal (Svanberg and Wille, 2009). Inner and outer motivation should not be seen as extremities on either sides of a scale, but rather as two factors that run parallel, both affecting motivation. Both inner and outer factors can affect motivation at the same time (Manger et al., 2013b). For instance, a person can be motivated both by his/her interest and joy in performing the action and at the same time be motivated by recognition and rewards such as feedback and monetary rewards. Also, inner motivation is often a result of previous outer motivation. The essence of why inner motivation is an important part of learning in a project organization (and any other organization), can be drawn from the quote below:

> *"What we know is that inner motivation make employees more content. Work-satisfaction, self-determination, responsibility for own work-situation and autonomy also makes employees take a larger degree of responsibility in the best interest of the organization, and therefore contribute to better results (trans.) (Kuvaas, 2008 in Filstad, 2010)."*

Outer motivation is closely connected to theories of positive and negative reinforcement, which can be found widely discussed within the behavioral learning perspective. Theory on reinforcement is presented in section 5.2.2. Incentive systems are one of the most used motivational factors in organizations, and also one of the most used factors of positive reinforcement. Their purpose is to give a reward for behavior that the organization wants (Jacobsen and Thorsvik, 2011). An incentive system is widely used in the case project and mother organization, indicating that outer motivation as a factor of learning should be evident.

### *3.2.5 Learning systems and systems thinking*

The term "learning system" primarily stems from theory on learning organizations. A learning organization is defined by Pedler et al. (1997) as "*A company which creates learning opportunities for all its members and is able to transform itself as whole".* The learning

organization is based on the work of Schön, who explored companies as learning systems, and how these systems could be enhanced. Perhaps the most essential contribution so far to the notion of the learning organization is Peter Senge's book "The fifth discipline" (Smith, 2001/2007, Filstad, 2010). This book has also been a major contributor in creating the systems thinking used in this thesis. Senge (1990) says the following about systems thinking:

> *"Systems thinking is a conceptual framework, a body of knowledge and tools that has been developed over the past fifty years, to make the full patterns clearer, and to help us see how to change them effectively … it is the discipline that integrates the disciplines, fusing them into a coherent body of theory and practice … Without a systemic orientation, there is no motivation to look at how the disciplines interrelate."*

By thinking in systems we can more easily see changes that occur over time, to see the full patterns and how we can change those patterns. Senge identified five diciplines that he thought needed to be present in order for an organization to be a learning organization, or at least work towards being a learning organization. A discussion about learning organizations is interweaved into the topic of this thesis, but is still beside what I am studying. Learning processes and learning systems are at the heart of a learning organization, and as earlier mention this thesis limits itself to looking at those processes. Still, Senge's five disciplines, ideas on systems thinking and the importance of this fifth discipline is the fundamental theory on which I build my thesis and my conceptual model of learning systems.

Senge's four other disciplines in a learning organization are personal mastery, mental models, building shared vision and team learning. In this thesis, the four other "disciplines" of the learning system are sociocultural learning arenas (team learning), individual learning (personal mastery), systematization and articulation of knowledge through learning mechanisms (building shared vision) and tacit knowledge (mental models). As this shows, even though the thesis limits itself to looking at learning processes and how these systemize, the disciplines present are in many ways similar, if not almost the same, as that of Senge's disciplines in a learning organization. By concretizing learning within learning systems, I still implicitly seek the bigger picture, where the goal is to develop DC and strive towards being a learning organization.

# 4 Creating the conceptual model

Based on all theory presented in part 2, I will in this chapter present the conceptual model created through a synthesizing of the aforementioned theory. As stated in section 1.4, this conceptual model, its analysis and possible revising in the concluding section of the thesis, is one of the focal contributions of this thesis. The conceptual model depicts learning processes and learning systems thought to make up the three learning mechanisms *knowledge accumulation, knowledge articulation and knowledge codification.*

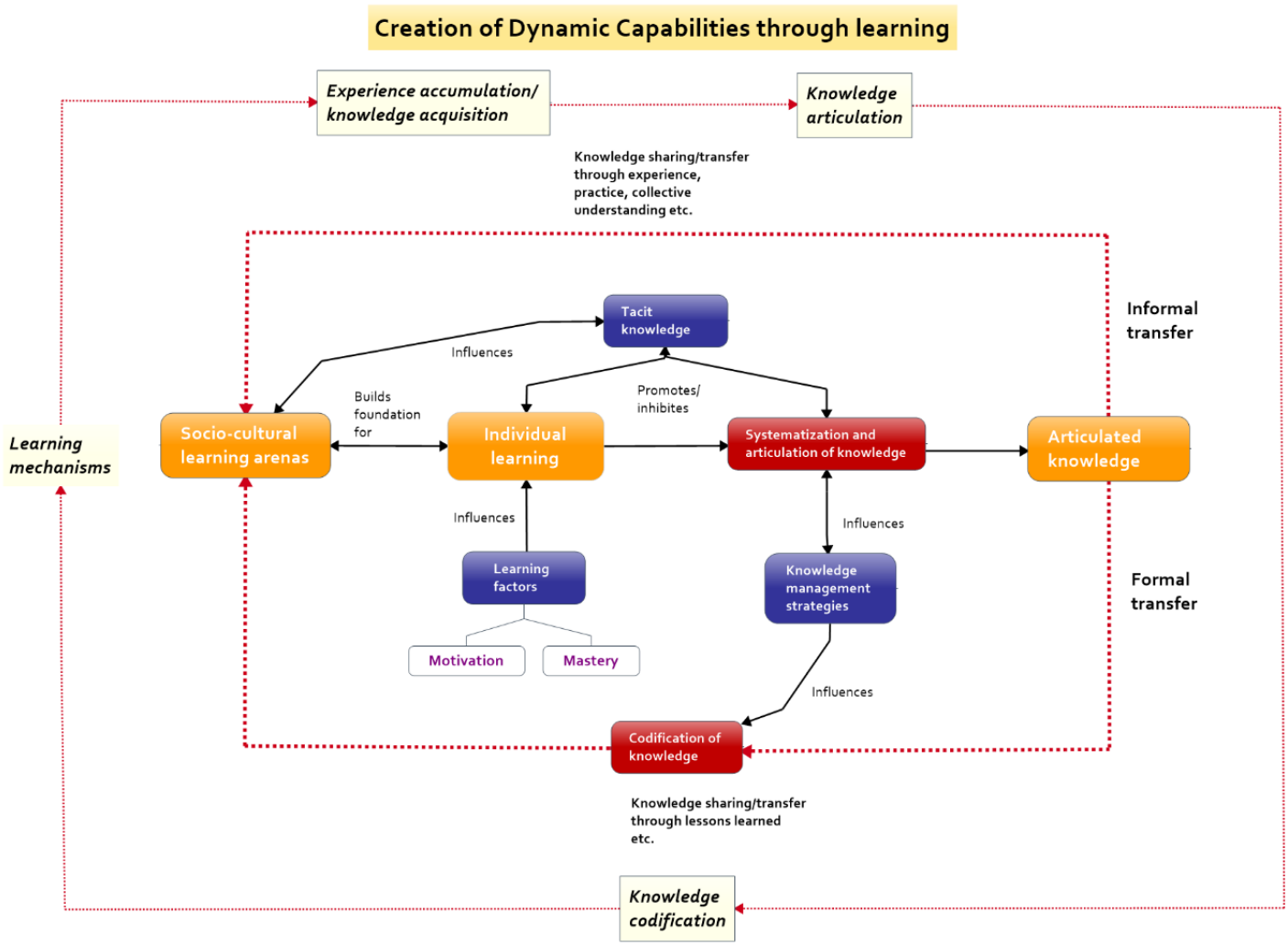



*Figure 4.1 – The theoretical conceptual model of the thesis*

## 4.1 On conceptual modelling

> *Conceptual modelling is the abstraction of a simulation model from the part of the real world it is representing … Abstraction implies the need for simplification of the real system and for assumptions about what is not known about the real system. In other words, all simulation models are simplifications of the real world (Robinson, 2010).*

A conceptual model is a model depicting a concept that can be found in the real world – and creating an abstraction/simplification of this concept. The production of such a model helps us understand complex concepts. It is important to note that models are just that – models radically simplifying a concept in order to make it researchable. The model is not an all-encompassing model of the process from individual to organizational learning. It is a simplification created to describe and understand how learning systems in project organizations can emerge within the sociocultural perspective, develop within individual cognitive learning, and through mechanisms and systematization, have the potential to contribute in creating DC.

The model helps support the statement that collective learning stem from individual learning and sociocultural learning arenas, and that by promoting individual and collective (social) learning and systemizing that learning, the organization can promote organizational learning and the creation of dynamic capabilities (Jacobsen, 2008, Filstad, 2010, Jacobsen and Thorsvik, 2011, Manger et al., 2013a, Manger et al., 2013b, Senge, 1990). The model is dynamic, meaning that there is a connection between the output and input of the model. This feedback ensures that new input can be supplied, making the model both retrospective and futuristic. The new input either passes through formal or informal channels. Formal channels include such factors as knowledge sharing and lessons learned, and the level of new input depends upon the codification processes utilized by the organization. This dynamic also presupposes that learning constantly takes place within the organization, thus underlining the fact organizations need to constantly learn and develop their knowledge in order to stay alive.

## 4.2 The model's learning systems, processes and factors

The model is surrounded by three learning mechanisms: Experience accumulation, knowledge articulation and knowledge codification. They create the framework for all processes and systems within the model. Zollo and Winter (2001) recognize these three generic learning mechanisms as focal to the creation and evolution of DC.

The circumambient learning system that the model depicts is the system starting and ending at the sociocultural learning arena. Inside this chief learning system, there are several subordinate systems and/or learning processes that affect its ambient system. One of these is the dynamic between the sociocultural learning arena and individual learning. As presented in 3.2.3, a fundamental insight within sociocultural theory is that we learn together with others so that we can continue to learn alone, and in turn be better equipped to participate in the social community of learning yet again. I also stated that this is shown by the two-way arrow between the sociocultural learning arenas and individual learning. This subordinate system also includes tacit knowledge and knowledge stemming from articulated knowledge. The articulated knowledge is either "returned" by informal or formal structures. This system is recognized by its informal structure, not dependent on (but can be encouraged by) any formal systematization in order to develop. It is dynamic and open, an ever-going process.

Within systematization and articulation of knowledge, several learning processes and learning systems can be uncovered. Knowledge articulation processes involve learning processes where people come together to articulate knowledge, confront, reflect and discuss. Tacit knowledge and the knowledge management strategies are key factors affecting this system as well. When analyzing the data material, I will reveal several processes focal to this system within the case project. Even more systems can be uncovered, but all systems are hard to isolate or separate from each other. Thus, an analysis of empirical data will reveal which learning processes and learning systems are focal to learning in the case project. The model will now be applied to the case project, thus revealing whether the model, its subordinate processes, systems and factors are applicable in empiricism.

# Part 3 : Method

A method can be defined as a way of gathering empirical data. The method is therefore an aid in giving a description of the interpreted reality (Jacobsen, 2005). This part will first present the qualitative method chosen for this thesis, and discuss its strengths and weaknesses. Then, the research design and strengths and weaknesses with the design chosen will be discussed in chapter 6. The method for data collection and how this data will be handled, transcribed and analyzed is discussed in chapters 7 and 8.

## 5 Choosing type of method – quantitative and qualitative research methods

One should avoid thinking of quantitative and qualitative research methods as opposites, but rather as two ends of a scale. Most research can be found somewhere along this scale (Jacobsen, 2005) The greater difference is that while quantitative research focuses on numbers and extensive research choices to convey meaning, qualitative research focuses on words and intensive research choices to do the same. Qualitative research is a more open method of collecting data, where the researcher strives not to apply constraints to the information that is being collected. This is why collection methods such as open interviews and observation fits the qualitative research method (ibid).

When studying learning processes and learning systems, it is of outmost importance to represent the views and perspectives of the participants in a study. The qualitative research method does just that (Yin, 2011). Yin (2011) states that "*qualitative research is driven by a desire to explain [real-world] events, through existing and emerging concepts."* For these reasons, the type of research method chosen for this thesis will primarily be the qualitative method. Also, the qualitative research and the sociocultural learning perspective fits well together. The main reason for this is that both qualitative research and the sociocultural learning perspective focuses on social interaction as a way of describing and explaining a phenomenon.

The use of a qualitative research method has several advantages. One advantage is that the respondents, to a large degree, choose themselves which information they want to provide, and what they see as important. The questions in the interview guide are just guidelines, and the respondents can provide information beyond these questions (Yin, 2011). Also, qualitative studies offer the possibility *"to conduct in-depth studies about a broad array of topics, including your favorites, in plain and everyday terms. Moreover, qualitative research offers greater latitude in selecting topics of interest"* (ibid).

### 5.1 Possible weaknesses when choosing qualitative research method

One of the major weaknesses of using a qualitative research as method is the lack of structure when collecting data. In an open interview the possibility of receiving non-relevant information or simply too much of the relevant information is present. A way of structuring which data is given in the interviews is to use an interview guide. I constructed an interview guide before conducting the interviews. This contributed a great deal in getting information on the same topics from all the respondents. Another challenge is that the extensiveness of data collected is limited by the time available. The work involved in transcribing data from in-depth interviews is extensive and time-consuming, which limits the number of possible interviews. This also limits the validity of the generalizations and theorizations in a thesis choosing a qualitative design. I have tried to limit this particular weakness by carefully selecting the respondents according to their position and type of work. Based on a list of desirable qualities created in a cooperation between the project manager and myself, the project manager suggested a set of individuals thought to fit the profile and needs of the thesis. Preliminary conclusions are that the selection of respondents and the variation of these, gave a very satisfactory data material.

## 6 Constructing the research design

A research design is a technical document that is developed by one or more researchers and is used by them as a guide or a plan to carry out a research project (Blaikie, 2009). It is the set of decisions that have been made regarding the strategies chosen and how these strategies will contribute to answering the problem statement and research questions

(Saunders et al., 2009). Blaikie presents four research strategies; inductive, deductive, retroductive and abductive.

All professions and studies make use of different decision patterns to draw conclusions based on their perception of reality and the perceived truth. The main strategies used in research are the inductive strategy, the deductive strategy, the retroductive strategy and the abductive strategy. The strategy most widely used in this thesis is the deductive strategy, but with some elements of the inductive strategy. These two strategies are therefore the subject of some elaboration.

Deductive strategy uses existing theory as a starting point. When using a deductive strategy, one therefore will borrow or construct a theory as a deductive argument and thereby produce a proposition that is to be explained by empirical data (Blaikie, 2009). The researcher will create expectations about how reality will appear based on theory and earlier studies. Then the researcher will collect empirical data to see how the expectations correlates with how reality appears (Jacobsen, 2005). The conceptual model of the thesis was constructed based primarily on theories drawn from several different disciplines/paradigms. Therefore, deductive strategy is used for much of the strategic base of the thesis. The theoretical conceptual model and its foundational theory will be explored empirically.

The opposite of deductive strategy is the inductive strategy. The inductive strategy aims to establish descriptions of characteristics and patterns of individuals and social phenomena. These descriptions a by nature limited in time and space, and cannot be seen as universal truths (Blaikie, 2009). The aim is for researchers to collect empirical data with no established expectations or collected theory and then systematize the data, thus creating theory/descriptions from empirical data (Jacobsen, 2005). The reason why the thesis has inductive elements is that some of the topics studied have a limited existing theoretical base. This includes topics such as learning in knowledge-intensive project organizations, how projects could contribute to dynamic capability development from the managerial perspective and a study of learning processes in project organizations from a sociocultural

point of view. The conceptual model will possibly need revising following the empirical analysis, thus indicating that the study involves some inductive characteristics.

## 6.1 Case study

According to Yin (2009), a case study is an empirical inquiry that investigates a phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. In a case study the focus is often set on one particular unit. These units can be limited within both time and place. In this thesis, the unit is the project organization presented in chapter 9. When the case is limited in time it often involves a certain situation, a particular decision process or because the case only exists over a particular period of time (Jacobsen, 2005). In this case, the latter is what fits the best. The project being studied is limited in time, hence the definition of projects presented in chapter 1. Thus, this case study fits the profile quite well, being limited in both time and place.

A disadvantage of case studies, some researchers have argued, is that it is only possible to describe the phenomena studied, and not possible to generalize or theorize. This critique is first and foremost founded upon three concerns: The first is the possibility of sloppy research and biased findings being presented. The second is that it is not possible to generalize from one case, because of the uniqueness of cases. The third is much the same as one of the major critiques towards qualitative studies, namely that it takes too long and produce unmanageable amounts of data (Blaikie, 2009, Yin, 2009). Yin (2009) responds to all three concerns. The first, he states, can be avoided by using methodical texts on case studies when constructing the study, and work hard to report all evidence fairly. To my best of ability, this is done in this thesis. Both Blaikie (2009) and Yin (2009) have been extensively used when constructing the case study for the thesis, and as the following section serve to show, all handling of data have been done methodically and treated fairly and honestly. In answering the second concern, Yin (2009) argues that:

> *"The short answer is that case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes. In this sense, the case study, like the experiment, does not represent a "sample," and in doing a case study,*

*your goal will be to expand and generalize theories (analytic generalization) and not to enumerate frequencies (statistical generalization).*

This is in compliance with what this thesis seeks to generate, namely an analytic generalization, thus presenting a theoretical proposition that can be further investigated through new studies. The third concern relates to time. Here, Yin (2009) simply states the fact that a valid and high-quality case study does not need to take a long period of time to conduct. This concern wrongfully confuses the case study method with a specific type of data collection, like ethnography and participant-observation. Chapter 7 will show the method of data collection connected to this case study, presenting a solution where a lengthy production of data is avoided. I also discuss how to avoid the production of unmanageable amounts of data.

# 7 Method of data collection

## 7.1 Sampling

According to Saunders et al. (2009), there are two types of sampling techniques. These are probability sampling and non-probability sampling. In probability sampling the probability of each case is known, and it is possible to achieve objectives that allow the researcher to estimate the characteristics of the population from the sample. In non-probability sampling it is not possible to make statistical inferences about the characteristics of the population (Saunders et al., 2009). Since data cannot be collected from the entire population and no statistical inferences are to be made from the sample, non-probability sampling with the purposive sampling technique is most fitting for the thesis. This allows the researcher to use his/her judgment to select the case that best answer the problem statement and research questions (ibid).

For this thesis, a selection has been made on four levels: industry, company, project and objects for interviews. The type of industry was primarily selected because of the high level of knowledge-intensiveness found in the projects. Further, the company was selected because they are market leaders within their industry and is a heavy contractor in the use of new technology and technological development. All of these factors should contribute to the

need of a high level of learning within the project. Next the choice of project organization relied on finding the project with the highest degree of new technology and where the organizational structure of the project would best fit the choice of data collection techniques. Two projects emerged as suitable case studies for the thesis. Geographically, one of the projects offered much better chances of periodical observation and closeness to the project. This was also a contributing factor when choosing the project that is now the case project for the thesis.

The objects for interviews were limited to the team surrounding the project manager and their respective employees. This team consisted of 10 members in total, four with their own team of about 10-15 employees and six members with support functions. When researching learning systems and learning factors both at an individual and collective level, it was seen as important to interview the team members that have direct contact with the project manager, but also important to interview some of the employees working directly with the tasks at hand.

## 7.2 Data collection, Individual interviews and the interview guide

For collection of data this thesis focused on primary data collected from observations and individual interviews with case subjects. Primary data can be defined as data which is collected by the author/researcher for the purpose of answering a particular problem statement and/or thesis (Jacobsen, 2005). "*One of the most important sources of case study information is the interview" (Yin, 2009).* Apart from primary data collected through interviews and observations, I also used some secondary data. This was first and foremost public articles on the project and organization charts from the project, but also some of the employee handbooks written for Statoil employees. The secondary data was not vital in the analysis of data, and therefore I do not see it as a weakness in the data collection process. All vital data stems from primary data collection. By using both interviews and observation as primary data, this strengthens the validity of the thesis and data material. The empirical analysis is not only based upon individual statements, but observations of contexts and authentic work-situations in the project. In total, I spent three days observing the project. All

three days included observation of one project management-team meeting, and also several follow-up meetings related to current agendas in the project.

The six interviews and three observations were conducted during a period of 5 weeks, excluding two of the observation sessions, in which one of them was used to present the thesis and the method to the project management-team. I chose to conduct in-depth interviews with the project manager and members of two different departments, a total of six interviews. The six interviews were conducted according to the interview guide, and handling and transcription equally so. The departments and respondents were chosen based on diversity through a set of qualities related to experience, position and type of work. The criteria where delivered to the project manager, who then suggested some members of the project whom he thought would contribute to the greatest possible diversity within the limits of the thesis.

Some pre-structuring preceded the in-depth interviews. This was done through the construction of two interview guides, one for members of the project and one for members in leadership positions. This was done to ensure that the essential subjects of enquiry were handled in the interviews. The interviews were conducted at the workplace of the project members, as a part of observing them in the social context that they are a part of. The interview guides can be found in the appendix. Some of the topics found in the interview guide did not find their way into the analysis of the thesis. This is not due to a biased selection of data, but rather because the scope of the thesis changed somewhat following the interviews because it was found too wide to be conducted within the limits of this thesis. Both due to time available and length of the thesis, some topics were therefore found not sufficiently relevant to the phenomena studied.

### *7.2.1 Confidentiality*

All respondents signed a declaration of consent regarding the interview process and transcription phase. The declaration also stated that all references to the interview would be confidential and anonymous and that all informants could be cited anonymously in the

thesis. All respondents signed the declaration of consent. The template for the declaration of consent can be found in the appendix of the thesis. Statoil's policy for studies and confidentiality, as well as company internal-information, demanded that the thesis remained confidential, and therefore unpublished. I therefore signed a declaration of confidentiality prior to starting the data collection process. The confidentiality of the respondents is cared for through the whole analysis-section, leaving out all names and titles, and generalizing only on leadership-level. Though, some statements regarding the project manager and his surrounding team-structures required the use of the title "project manager". This was cleared with the project manager prior to handing in the thesis.

# 8 Analysis method

Yin presents a five-phased cycle to data analysis. This includes compiling, disassembling, reassembling, interpreting and concluding (Yin, 2011). Before one can start the analysis, there is a need to transcribe the raw data that is collected. It is important to transcribe the raw data as soon after collection as possible (Jacobsen, 2005). This is an advice that I followed by taping all interviews and then transcribing them immediately after each interview. After this was done, the transcribed interviews were categorized and labelled according to the interview guide.

## 8.1 Validity and reliability

With all methods of data collection, some rules apply. First of all, it should satisfy two demands; validity and reliability. With validity one means that what is researched is actually what was the purpose of the research, that it is conceived as relevant to more than just ourselves and that what we discover from the sample can be valid for a greater population. The reliability builds on the notion that the research has to be trustworthy. Is it possible that the same result could emerge if the research had been done in the exact same fashion at a different time (Jacobsen, 2005)? There is some debate about the use of these two terms in qualitative research. Some say that it is difficult to recognize the validity of a qualitative research, especially in terms of it being valid for å bigger population. These researchers tend to use terms such as trustworthy instead of validity (Yin, 2011). The same is said about

reliability. Critics state that it is close to impossible to conduct a qualitative research two times with the same result. The term transparency is used in its place. I do not take any side in this discussion, but see the usefulness in discussing both trustworthiness and transparency, and will therefore use the terminology used in Yin (2011).

Yin (2011) uses three objectives for building trustworthiness and credibility into qualitative research, these are transparency, methodical and adherence to evidence. A research procedure should be transparent, meaning that it should be done in an accessible manner. The method used needs to be thoroughly described and documented, leaving no room for misinterpretation as to how the research has been done. In order to have a methodically conducted research, the second objective, methodical research is important. This objective refers to the research procedures followed during the research process and prevent unexplained bias and deliberate distortion in carrying out research. The last objective is the adherence to evidence. The qualitative research needs to be based on an explicit set of evidence. Evidence can be participant's words about reality or collected and processed data. If there are multiple perspectives on a subject, the analysis needs to take into account all perspectives.

In this part of the thesis, I have strived to describe the method used in the most precise manner possible, aiming to promote transparency. When carrying out the method in the process of data collection, I have followed the processes described as precise as possible. Thus, I have strived to obtain the second objective. In order to care for the last objective, I have used an extensive amount of quotes/statements from the data material when analyzing the data. These quotes are consistently linked to theory and the conceptual model, aiming to uncover the relations between data collected and theory presented in part 2. By using the collected and processed data explicitly in the analysis part, the thesis is firmly founded upon two sets of evidence – the theoretical set presented in part 2 and the data set presented in part 5. These two are constantly linked together through repeatedly analyzing the conceptual model.

# 9 About the company and the project/case

This thesis demanded a project where a high level of learning takes place throughout the entire project. Based on this, the case chosen for this thesis was Statoil's project "Gullfaks subsea compression" (hereby referred to as GSC). This is a project with a high level of knowledge intensity, and the project's foundation is new and groundbreaking technology not yet used in any other project or installation.

## 9.1 The company

Statoil is a multi-national integrated oil and gas company with over 21 000 employees worldwide. Statoil is present within 33 countries, but the largest amount of activities can be found in Norway. Here Statoil is the largest operator on the Norwegian continental shelf, and a license holder in numerous oil and gas fields (Statoil, 2013b). Among these fields is the main Gullfaks field located in the northern part of the Norwegian North Sea. The field of operations in which Statoil operates, is a field with a high degree of technological development, change and regulations. The business is also undergoing changes due to a sharpened focus on cost control following challenges in keeping costs down. International competition is now more evident than ever, making it more important for Statoil to evolve and make the organization more cost-efficient. This makes it even more important to create dynamic capabilities, and efficiently making the most out of the learning developed in projects (and the organization in general).

## 9.2 The Gullfaks subsea compression project

Much of the information about the project and its data has been collected from my main contact at Statoil, and is therefore difficult to give a proper reference.

GSC is an IOR (increased operations recovery) project that officially started in March 2013, but Framo Engineering received the contract of developing the technology as early as 2009 (Statoil, 2012). The project is expected to be completed in September 2015 and has an expected investment of approximately 3,2 billion NOK. The project uses technology for

subsea compression of wet gas never before used. In short, the project will install one single compressor for compressing the wet gas, while earlier gas compression have divided the condensate from the dry gas and compressed these two separately. In the fact sheet in Statoil's press release on the GSC project, you can read the following statement:

> *The introduction of subsea wet gas compression will increase recovery from the Gullfaks Sør Brent reservoir by 22 million barrels of oil equivalents, corresponding to a four percentage point increase of the expected recovery rate (Statoil, 2011).*

Combined with conventional low-pressure production on a later stage, the recovery rate can be increased from 62 % to 74 % on Gullfaks C. The subsea compressor module will be placed next to the M and L template in the Gullfaks field, and all topside installations will be placed on Gullfaks C (see figure 9.1). This includes rebuilding a section of the platform to make room for a high voltage room, as well as building several new platforms below the existing decks. The umbilical for the compressor module will come directly from Gullfaks C, and when installed the production will use existing pipelines between the M and L template and Gullfaks C.

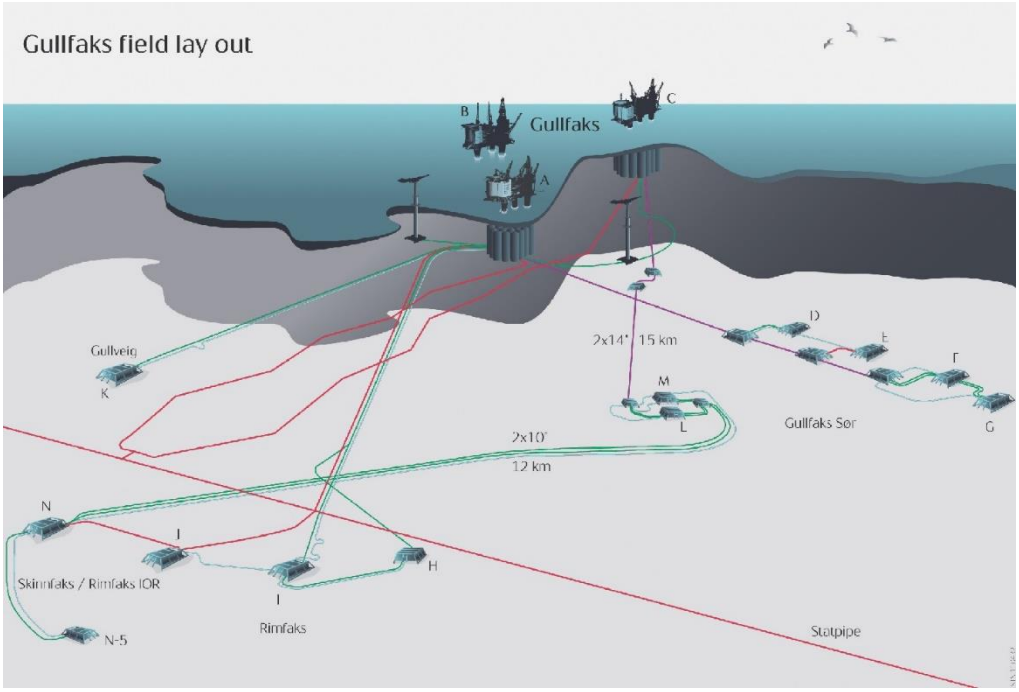



*Figure 9.1 – Gullfaks field layout (Statoil, 2011)*

The technology used in this project is considered to be a considerable technological leap forward and has a widespread field of use. It is expected that several new projects will be

initialized in the wake of this project. This underlines the fact that this project is especially fit to be the case study of this thesis. Bringing learning and knowledge from this project and onto other future projects is of the outmost importance as this project and the technology used can be seen as pioneer-work within its field.

The project is a part of a portfolio consisting of two similar project – Gullfaks and Åsgard subsea compression. The project manager for GSC manages four underlying teams, each responsible for their own part-delivery. In total, the project consists of close to 100 members.  When collecting data for this thesis, I interviewed members of a total of three levels: The project manager, department managers of two underlying teams and members of their respective teams. One respondent had a support function in addition to belonging to one of the underlying teams.

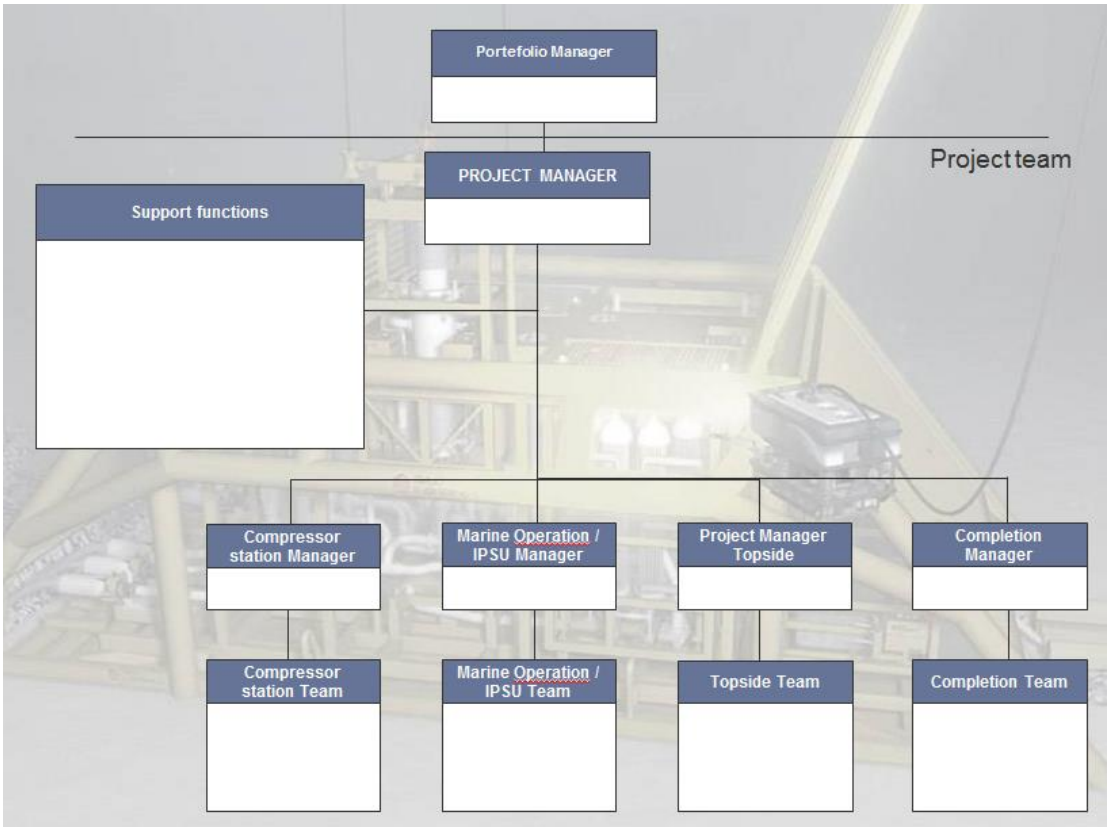



*Figure 9.2 – Project organization structure*

## 9.3 “People at Statoil”

*People at Statoil* is an extensive incentive-system, including systems for appraisals, feedback, individual goal-orientation, monetary rewards and co-worker evaluation. For all team members, Statoil defines both delivery goals and behavioral goals. Delivery goals are set to clarify each team member’s accountability and to support performance evaluation, while behavioral goals are set to advance the key values of the organization, and to address the behavior required and expected in order to achieve the delivery goals. From the Statoil Book, one can read the following: *“My Performance Goals (MPG) are set in two dimensions, delivery and behavior, reflecting that delivery and behavior are equally important and weighted”* (Statoil, 2013a). The project manager does the evaluation and follow-up of every team member’s performance goals, but it is the line manager that has personnel responsibility and set the goals together with each employee in his/her division.

# Part 4 : Analysis

The following part is an analysis of the six in-depth interviews and the three observation sessions performed in the case project. The purpose of this part is to give an in-depth analysis of the case project concerning the problem statement and research questions. The structure of this part will therefore follow both the structure of the research questions as well as the structure of the conceptual theoretical model of the thesis presented in chapter 4. Chapter 10 will start with a brief presentation of how the project members view the concept of learning, and whether they see it as important. I will then go on to analyze the framework for learning in the project organization. I will do this by analyzing which learning perspectives and learning arenas that are most evident in the project. This chapter will answer research question number one. Chapter 11 will briefly present findings on knowledge management strategies, as well as one of the most important findings in the case project – the extensive use of support functions.

Chapter 12 is the core chapter of the analysis, where I will systematically analyze each of the three learning mechanisms, how they appear in the project and which learning processes and learning systems are found to constitute each learning mechanism. It will discuss all aspects of the conceptual model, and answer research question number two and three. Each section of the conceptual model will be linked to its respective learning mechanism.

All quotes in this part are written in English in order to fit the structure of the thesis. One interview was done in English, while the other five were conducted in Norwegian. That means that a majority of the transcribed material used as quotes, is translated from Norwegian to English.

# 10 Learning perspectives and learning arenas

This chapter will answer the first research question, which is:

*Which learning arenas and learning perspectives were most evident in the project?*

Both the learning arenas and learning perspectives found in the project serves as part of the framework for all learning in the project organization, and I strongly believe that a solid framework is of outmost importance if I am to answer the problem statement sufficiently. The sociocultural learning arenas thought to initiate learning (as depicted in the conceptual model) are only one of the learning arenas expected to be found in the project. Learning arenas are all arenas where learning takes place, and will be evident through all aspects of the conceptual model.

When analyzing learning arenas and learning perspectives it would be natural to start with some information on how the respondents understand the concept of learning and what they find important:

*"I would define it as a process of gaining knowledge, building knowledge on something that you can actually use afterwards, in other projects in this case, or in other companies. You build your competence."*

*"Learning can emerge on many levels. The way I see it as an engineer, is that we do a lot of knowledge learning."*

*"I learn more in my position [middle manager within technical lead] today, than what I did in my old position as engineer. When working as an engineer in the base organization it is only technical things that need to fit into the interface, while now I have people that work together to solve a task. So my learning consists more of understanding people than things."*

Learning was defined both as an individual cognitive process and a collective competence. Also, learning was understood as something that developed on different areas, from technical knowledge to knowledge on how to cooperate. The respondent's position and degree of routine seemed to affect how the respondent viewed learning. The younger respondents were more focused on the individual, cognitive aspect of learning, while the

more experienced respondents tended to focus more on collective competence. This was also evident among respondents in leading positions, which should be obvious. They are responsible for making their employees work together. Focus on which part of learning is important, also differed. While some emphasized the experiential, individual side to learning, others focused more on the collective, social side. These differences, along with the focal statements on learning, build the foundation for the following sections of this chapter.

## 10.1 Learning perspectives

The three major learning perspectives discussed in the theory part of this thesis are *the behavioral learning perspective, the cognitive learning perspective* and *the sociocultural learning perspective.* The perspective that the conceptual model of this thesis is founded upon, is the sociocultural perspective. A key perception within the sociocultural perspective is that humans learn when they work with knowledge in a social setting/context. In a sociocultural perspective the attention is turned both towards the individual and the social context of which the learning takes place (Svanberg and Wille, 2009). Critique of applying the sociocultural learning perspective on project-based learning was presented in section 5.2.3, and findings answering this critique will be presented in this chapter.

The behavioral perspective, and especially operant conditioning, was found extensively used within the subjects of motivation and Statoil's incentive system called People at Statoil. *People at Statoil* as an incentive system was concluded to be beside what this thesis studies. Also, the interviews revealed controversial elements deserving a far greater analysis of PaS than what this thesis could cover. It is therefore only brought into the thesis as a part of chapter 13 – *implications for the case project/company* in addition to some references. Another fundamental topic within the behavioral perspective found extensively in the case project was the "learning by doing"-principle, which is evident in both the behavioral and sociocultural learning perspective. The "learning by doing"-principle focuses on performing actions, and by that learn and be better at the actions that has been done (Manger et al., 2013a). On the same line as theories concerning CoP, this principle somewhat denotes repetition of tasks and tacitly gaining knowledge, thus also being related to the learning mechanism perceived to have the lowest investment in learning – experience accumulation.

Another focus within the behavioral perspective is that what is sought to be learnt should be broken down into smaller units, and reinforcement (positive or negative, normative or formative) should be given immediately after the learning has taken place (Svanberg and Wille, 2009). A challenge when applying the behavioral perspective on the case project is that the behavioral perspective is, implicitly or explicitly, in need of a mentor/teacher/facilitator that can monitor the learning and give immediate feedback. In a knowledge-intensive project with a high degree of engineer-density, all observations and responses points in the direction of a high degree of autonomy in the work situation. Based on this, I conclude that principles from the behavioral perspective definitely are present in the project, but more as a part of motivational theory, evaluation through the incentive system *People at Statoil* and as an integrated part of the sociocultural perspective.

### *10.1.1 The cognitive learning perspective*

As stated numerous times, the cognitive perspective is also important when understanding learning through the sociocultural perspective. Even so, learning in engineer environments seem to have a fairly high degree of focus on learning on the individual level, though with a strong support function from the team and other support functions in the tech-department/specialists. Learning is not taken out of its context, and is therefore both situated and context-related, but at the same time it is often individual-based and individually initiated. Therefore, a high degree of self-efficacy is also present in the project. This is in concurrence with presumptive arguments in part 2.

*"The experience that I have made is that engineers usually know the answer before they come and ask, but they want support for the conclusion they, in reality, had before they come and ask."*

*«The project can facilitate experience transfer internally, facilitate arenas for discussions where one can exchange experiences and they can encourage solutions for a task. But it is ultimately up to oneself in the project, and it has to be that way, because it is so specific the task that you solve there and then that the task is learnt as you go along."*

These statements underline that the employees find development of individual cognitive structures through assimilation and accommodation and individual problem-solving

important. At the same time, they underline the importance of having support structures available at all times.

*"When I have a problem I first try to sort it by myself, but of course I always find barriers."*

When presented with these barriers, the learning system used is normally a path from the individual level, through co-workers or directly to a technical manager/specialist.

*"The technical manager/specialist has a responsibility. He is my support function. He is not going to be the one that says "now you do it like this and that". He is supposed to be my – if I have an idea I go to my technical manager with a problem and say "I want to do it like this. What do you think about that solution?"*

Learning is therefore lifted from the individual level to the collective, social arena where learning is done in groups. However, the individual taking the initiative is still the leading participant in the collective learning taking place. The knowledge/solutions are then brought back to the individual level as an expansion of the cognitive structures of the individual. Thus, the assimilation and accommodation process are evident especially through the later stages of this process. This learning system therefore has clear elements of principles found in the cognitive learning perspective, though it can be argued to somewhat been taken out of the context of a larger framework – foundational principles within the sociocultural perspective. The learning taking place in this learning perspective is after all context-related, situated and mediated. It is also, even though it is initiated at the individual level, processed from the collective and back to the individual level, making the individual better suited for participating in learning arenas at a later stage (Manger et al., 2013a). Whether part of cognitive theory or sociocultural theory these learning processes and learning mechanisms build a solid foundation for the further development of DC. Though learning is definitely present, in most situations like those analyzed above, learning is not the main goal of the tasks undertaken, and neither is the learning deliberate. Therefore, they are first and foremost and integral part of experience accumulation processes.

### *10.1.2 Sociocultural learning perspective and learning arenas*

The last points made in the previous section are of importance when going on to discuss how principles from the sociocultural learning perspective were evident in the case project. The two-way arrow between sociocultural learning arenas and individual learning in the conceptual model depicts this very type of learning system. The statements below serve to show several different situations where the sociocultural learning perspective is evident.

*"I can set up a meeting whenever I want if I want to discuss a problem, and many times I feel that I don't have enough knowledge to give an answer to for instance installation problems.*

*«The best type of learning is the one that you do in your work situation and especially when working with problem solving. You often find yourself in places where you are a little bit outside your comfort zone because you have a technical problem. In situations like that, you often need to draw on competence from several different disciplines and other people in order to solve it.*

*«If I have a problem that I need solve, I need to talk to people who have been working with similar problems and involve them in the process. You asked about conscious learning, what do we have when it comes to that? It is a course or a seminar or something, and that is close to nada these days."*

*"I think the 70-20-10-rule is important. Sending individuals to courses is just 10% of our everyday practice. It is the 70% that is important. To be thrown out into the tasks – on the job-training. To be able to work your way around it."*

It is quite evident that situated, practical, informal processes are acknowledged as the main path to learning. Learning is something that, first and foremost, happens in the work situation itself. Thus, formal learning is not something that is given focus. This is also explicitly stated by one of the respondents when discussing conscious learning. The sociocultural learning perspective also focuses on learning as something *both* socially connected *and* with attention to the individual. Even though all statements point towards on-the-job-training and the use of co-workers in the learning process, they also serve to show that the process is often initiated when the individual discovers a problem that he or she needs help solving. Individual and collective learning should not be seen as two separate systems though, because learning is a continuous process where elements of learning together with others are mixed with cognitive learning at the individual level.

Though it seems evident that learning, to a large extent, is initiated at the individual level, it was also stated that learning was both initiated and took place at social arenas such as team level. When one of the leaders were asked the question whether there is a lot of individual initiatives or if they mainly work as a team when facing major challenges/problems, the answer was that they definitely work mostly as a team, building on each other's competence.

*«We then work mostly as a team to find solutions. I especially saw it when we hit a wall on a topside installation. Then I really saw a will in the topside-team as well as with the subcontractor to find solutions together … A massive amount of work was done. Everything was turned upside-down without causing any type of trouble afterwards."*

The statement supports Vygotsky's theory that people are dependent on a social environment in order to develop and learn. Not the least, the statement above show that elements of DC are already very much present in the project organization. DC is recognized by the very ability to integrate, build and reconfigure competences to make the organization better suited to adapt to rapidly changing environments Also, DC is connected to the ability to change the organization's operating routines (Teece et al., 1997). The organizational structures and culture in the project have clear dynamic elements making the project better suited to face challenges.

The statements presented earlier in this chapter also support Vygotsky's theories on the zone of proximal development. He defined the zone as *"the distance between what an individual can perform on his/her own without support, and what the individual can perform with help from another more qualified person"* (Manger et al., 2013a). Technical managers/specialists from the tech-department and co-workers with a large degree of perceived experience and knowledge seem to be extensively used as support.

*"There are some people with authority, and subconsciously they are asked for help and advice. I am convinced of that."*

This indicates that all the structures are in place, giving the individual the possibility to optimize his/her zone of proximal development, but it is still the responsibility of the

individual to make use of the support functions. The culture in the project seems to be that there is a large degree of trust in that each individual takes responsibility for his/her tasks and ask if they need support.

The critique against applying the sociocultural learning perspective to project-based learning is primarily founded upon two arguments. The first is that theory on CoP is not easily applied to projects, because projects typically "*lack the community-building effects found in localized, ongoing and more routine work activities* (Gherardi et al., 1998, in Swan et al., 2010). The second is that project learning and team learning have different characteristics, especially when it comes to time, frequency and heterogeneity of tasks, stable membership, shared goals, psychological safety and mutual trust (Swan et al., 2010). Even though most of the responses indicate that important principles from the sociocultural learning perspective is widespread in the project, other statement also point in another direction:

*"In a way, projects work very autonomous. One can work in a base department together with maybe four people, and they have Gullfaks A, B, C and everything that has to do with corrosion and… They sit in a group in an open landscape, and they talk together a lot. Here there is one person on material, one on pipes, one on structure. We work a lot like that … we're like a little satellite."*

*"We always have to think "we, the project". When it starts to tighten every single person starts to narrow their scope, and then it is straight into their silo and their own delivery responsibility, and there will be no success before we succeed together."*

Both of these statements underline that there are challenges when it comes to teamwork in projects. The first statement support the argument put forth by Swan et al. (2010). It supports this statement in the sense that a member with a certain profession can be a bit isolated, because they are the only person working with their particular field. Theory on both teamwork and CoP emphasizes community-building effects such as strong ties, common identities and shared goals as focal points in the development of situated learning and CoP. Even though it can be argued that it would be easier to accentuate these elements in environments recognized by homogeneous professions, there is also another aspect to consider. Through several of the statements presented in this part, it is clear that these elements are evident especially in the different departments of the project, though maybe

not that evident in the project as a whole. The community-building effects thus were quite evident within each department sharing a common field of work (e.g. topside, subsea and marine).

The second argument focuses on how project-based work and teamwork have different characteristics. The first characteristic is that a project has a higher degree of heterogeneity and lower degree of frequency when it comes to tasks. Through analyzing the data material, this could be said to be true. The heterogeneity of tasks is high, especially at the subcontractor level. Stable membership, shared goals, psychological safety, mutual trust and also collective or group-level reflection on the other hand, are critical factors gain far greater foothold in the project, making the structure of the team (and especially its departments) more similar to that of a team.

*«We have people that have been involved in this project for 6-7 years. They possess an enormous amount of knowledge. What we did … we brought in new people in the beginning of the project. We then did like I said, and had mentors and specific people that had a lot of knowledge and used these people as a type of mentor."*

The use of mentors is consistent with theory on CoP presented in part 2. This particular project has a time frame spanning over more than 8 years, making it hard to dismiss it as "*highly time-bounded social interaction"* (Swan et al., 2010). In addition, when asked whether the respondents were conscious of their team-member's earlier experiences, one respondent stated that:

*"I am, because we are a relatively small team. We have worked together for years now, so we know exactly each other's background and what each person has done - competence and all that."*

The statement that all team members knew about other team members past experiences were inconsistent with what some of the other respondents answered and will therefore be problematized in the next chapter, but the fact that they have worked together for years show that there is a stable membership in the department. In addition, *"The majority of people are working with GSC 100%"*, thus reducing the risk of cross-pressure from different projects and/or tasks.

The project plan contributes in creating shared goals for each department and the project as a whole. The interviews revealed a clear understanding of the goals set for the project, and gave an impression that everybody worked towards common goals. In addition, statements presented in earlier chapters reveal that there is a high degree of collective and group-level reflection in the project. This will also be discussed further when analyzing the knowledge articulation as a learning mechanism in the project. The project manager seeks to create mutual trust in the project by applying a "hands-on" leadership style. According to the project manager, the most positive effects of this leadership style were:

*"It is the degree of openness. There are no surprises. There is openness and a will. We are a team that is going to deliver."*

When done right, this leadership style contributes in creating a mutual trust in the project by making sure the members know that they have the support of the manager and can contact him/her if they have a problem. The project manager states that the feedback he receives also points in this direction. At the same time, the trust has to be mutual.

*"I give my employees a lot of responsibility. I don't dig into every single thing that they do."*

# 11 Knowledge management strategies

Numerous documentation and codification processes were evident in the project, at least from a management strategy-perspective, revealing a solid investment in knowledge codification as a learning mechanism. The knowledge management strategy of the company is definitely closer to a codification strategy than it is to a personalization strategy, but the informal, implemented strategy of the personnel in the project organization showed signs of being closer to a personalization strategy. At least on some areas this seemed desirable. It is important to underline that this was not the case for all codification processes initiated at the organizational level. For instance, risk-management systems and action-related documentation requirements were acknowledged as important both by members of the project and the management. Knowledge-transfer processes and report-systems on the other hand, were more controversial, revealing a dissent between demands from the organization and actual codification processes being performed by the members of the

project. Thus, the case project revealed elements of both the codification strategy and the personalization strategy.

All projects within Statoil seem to rely heavily upon their tech-department in terms of specs, requirement documentation and other operational documentation when carrying out tasks. The technology department receives continuous input from projects, processes it and creates new output in terms of updated documentation, requirements, specs and documented ways of carrying out tasks.

*"We rely and make use of the base-environment in Statoil for learning and such. In Statoil the tech-department/specialists possess the knowledge and own our requirement documents. So if we cannot be in compliance with the requirements because of different things, we need to apply for a one-conformancy. If we do that, we apply for an exemption from our requirements."*

The tech-departments and requirements works in a way like a massive knowledge database, consisting of employees whose purpose is to be a specialist in their particular field and a support for the project and its members. At the same they time make sure that requirement documentation is constantly updated to match what is done in the projects.

*"Based on the learning undergone in the different projects, they [the tech-department] receive input to work with. So our requirements are based on years of learning and experience. Both positive and not the least negative experience and learning."*

Codification systems and processes are further analyzed in section 12.3.

# 12 Learning mechanisms

This chapter will answer the second and third research question, which is:

2. *What role plays individual learning in intra-project learning in knowledge-intensive organizations?*
3. *Which learning processes and learning systems can constitute the different learning mechanisms in knowledge-intensive project organizations?*

Zollo and Winter (2001) recognize three learning mechanisms fundamental for developing DC. These three are *1) experience accumulation, 2) knowledge articulation* and *3) knowledge codification*. *Experience accumulation* is recognized by a quasi-automatic process that involves accumulating knowledge through experience. *Knowledge articulation* is recognized as a learning mechanism that includes more deliberate and conscious learning. In the process of knowledge articulation, the members of an organization deliberately seek arenas where they together or individually can figure out what works and what doesn't (ibid). Knowledge codification is a step beyond knowledge articulation, and involves codifying articulated knowledge into written or recorded tools such as manuals, drawings, instructional videos, databases, written assessments and knowledge transfer tools. In part 2, I presented a table based on the work of Prencipe and Tell (2001) showing the link between each learning mechanisms and a set of learning typologies. The table is shown below, and will work as a framework when discussing the learning mechanisms found in the project.

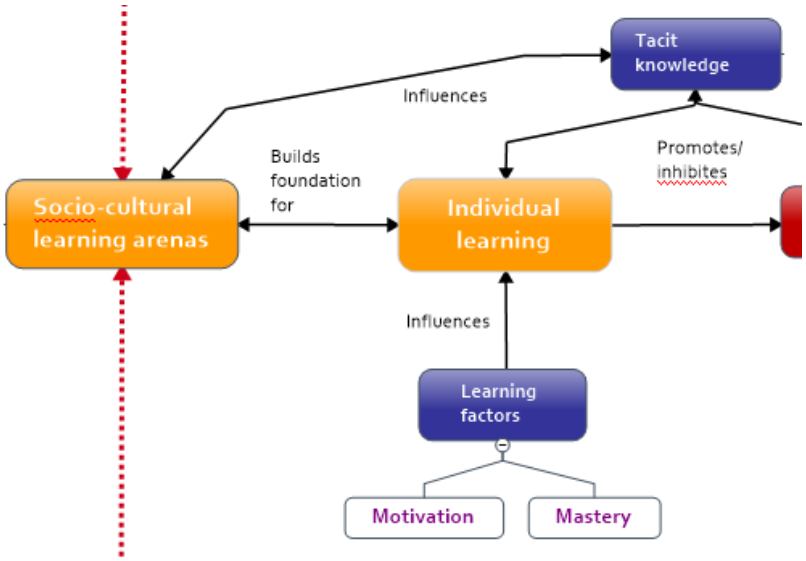
| | Learning processes | | |
|---|---|---|---|
| | Experience accumulation | Knowledge articulation | Knowledge codification |
| **Learning typologies** | • Learning by doing<br>• Learning by using | • Learning by reflecting<br>• Learning by thinking<br>• Learning by discussing<br>• Learning by confronting | • Learning by writing and re-writing<br>• Learning by implementing<br>• Learning by replicating<br>• Learning by adapting |
| **Outcomes** | • Local experts and experiential knowledge in individuals (e.g subject-matter expert) | • Symbolic representations and communication<br>• Improved understanding of action-performance relation | • Codified manuals, procedures, assessments, knowledge-transfer tools and other written or recorded tools (e.g project management process) |

*Table 2.1 – Learning typologies and outcomes of the three learning mechanisms* (Prencipe and Tell, 2001)

## 12.1 Experience accumulation

Typical learning typologies connected to experience accumulation are learning by doing and learning by using. The outcomes are, to a large extent, experiential knowledge at the individual level, which can in turn be used in social settings to create and accumulate group experience as well as forwarding improvisational learning and learning at the individual level. Learning develops as – and through – experience and tacit knowledge. The processes connected to experience accumulation are largely implicit, meaning that learning is not a

conscious result of the processes. Experience accumulation is linked to the following part of the conceptual model, where knowledge is accumulated largely through authentic work-situations and on-the-job-training.




*Model 12.1 – Experience accumulation system*

Statoil is a massive organization, with more than 21 000 employees. The project includes more than 100 members. The project is also in a state of constant change, especially because of the high degree of new technology input, but also simply because of the very nature of a project. In addition, the environment in which the project is operating is constantly changing and the organization is in a state of change to reduce costs and increase efficiency. All these factors make the chance of a one-sided focus on experience accumulation almost obsolete. In dynamic and unpredictable environments, semi-automatic processes and tacit accumulation of experience wouldn't be enough to develop functional DC (Zollo and Winter, 2001). Even so, experience accumulation contributes in building the foundation for the other two learning mechanisms, and this is also evident in the case project. Swan et al. (2010) found that accumulated experience embedded in organizational routines could act as an enabler for improvisational learning. Their findings are consistent with what was revealed in the case project. Several of the statements both presented in earlier sections and presented below support the notion that both learning by doing and learning by using were favorable ways of working with knowledge among the respondents. The following analysis is a continuation of analysis in chapter 10.

*«The best type of learning is the one that you do in your work situation and especially when working with problem solving.*

*"I like the learning by doing. That is the best way for me … When I joined Statoil I had two months filled with courses and documentation and technical requirements and I can say that for me it was useless."*

Previously presented statements also emphasized on-the-job-training as a strategy favored by middle managers in the project. When favoring this type of strategy, it is of great importance that one has the necessary support structures in place, so that the individuals or group's training and learning are characterized by predictability. Examples can be organizational routines, mentors, communication structures and knowledge on who knows what. It has been discussed how the case project makes use of mentors, the tech-department and have requirement documentation for management-routines. In addition, statements presented when analyzing learning arenas in the project show that employees have a culture where they are encouraged to contact each other. They also make use of support structures to facilitate and support their own zone of proximal development.

Communication, individual initiative and informal meetings are key mechanisms in experience accumulation processes in the case project. When talking about knowledge sharing, the respondents agree that they are good at sharing knowledge in the project:

*"Here we share everything – both good and bad."*

*"You can actually use your colleagues like I do most of the time which is just to give them a call. That has been the most valuable thing for me so far. Accessing their knowledge and being open towards them and not being afraid to make questions. That is also one of the things you are told when you join."*

Knowledge sharing is extensively used in the project, primarily through informal channels, or through person-to-person contact. They have an understanding that it is important to contact each other when they need help to solve a problem. From the interviews, observations and analysis, it seems obvious that there is quite a bit of improvisational learning taking place in the project through informal knowledge sharing and communication.

*"I can set up a meeting whenever I want if I want to discuss a problem, and many times I feel that I don't have enough knowledge to give an answer to for instance installation problems.*

This also shows that informal meetings are frequent, enhancing the notion that informal mechanisms connected to experience accumulation is important. In experience accumulation, the learning is often implicit and subject to something else. Often, this is a problem or task that needs solving in order to keep moving forward. This was also the case in the project. Respondents stated that they often were not conscious of when they learned, but that it was easier to recognize the situations in retrospective. Their focus was on solving the problem that they encountered.

### *12.1.1 Tacit knowledge as part of the experience accumulation*

Tacit knowledge is anchored in practice and experience, in the action itself and its context and situation. This is why it is so hard to harvest and log tacit knowledge. Filstad (2010) claims that a combination of explanation and at the same time being able to show what is being taught, is a good way of learning tacit knowledge to others. Learning-by-doing has been extensively analyzed in the preceding chapters. Learning-by-doing, combined with guidance and support of an individual that possesses the tacit knowledge, is key factors in transferring tacit knowledge. Polanyi supports this by claiming that tacit knowledge is learning through action. The person wanting to learn the tacit knowledge needs to practice it himself/herself (Polanyi, 1966). A crucial part of making use of each individual's tacit knowledge in experience accumulation processes is to know what you know yourself and also know what others possess when it comes to experience.

When asked whether it would be smart to formalize experience sharing at the beginning of, or during the project, especially the experienced respondents were strongly against it:

*"No, lower the threshold, let people talk together and be close. Once you formalize … the minute you make formalism you create pigeon-holes. Talk to people! Let people talk together. Computer systems solve nothing, and formalism… Bring it down and let people talk together."*

The younger respondents, on the other hand, were not always sure who to contact when facing a problem. It was not always clear who had the knowledge and experience they needed. They were more open to documenting the tacit experience of employees, so it would be easier to find out who had which experience:

*"Maybe we should have lists. Actually, on a few people you can check their profile in Statoil. There you can find what they have been doing and what they have been working with and which experience they have. Maybe all of them should have this."*

The difference in opinions when it came to age and experience could be due to the fact that the respondents with more experience have worked in the company for a longer period of time. Through *experience* and *interaction,* they have gained knowledge about the tacit experience of their co-workers. Therefore they appreciate more the informal channels than digital databases where information about each person is stored.

One respondent problematized whether it is possible to documenting an individual's experience base by stating that it is difficult to know what their co-workers really know before they have seen them *use* the tacit knowledge that they possess. When asked whether there were arenas where the experience that each individual possess was conveyed to the other members of the project, one respondent stated that:

*"No, and I think that would be hard. It is made visible when one has a need that needs to be covered in the everyday work. It is hard to make a big deal out of what everybody knows before we begin, because everybody knows so much. So it is made applicable when we need to solve a problem that doesn't fall naturally under one person's jurisdiction, and that happens a lot in a project because we have limited amount of resources."*

The fact that some of the respondents were unsure who to contact when facing a problem is a finding indicating that there is still some unreleased potential in the individual tacit experience base in the project. However, it is difficult to make any conclusions how, or even it is possible to reveal what your co-workers possess of past experiences based on the data material present.

### *12.1.2 Thoughts on individual learning in experience accumulation processes*

Through the preceding analysis, individual learning has shown to be a substantial part of experience accumulation in the case project, though with clear and important elements from the sociocultural learning perspective. Through the interviews, I found that the employees largely focus on problem-solving tasks, not necessarily deliberately focusing on learning when solving these tasks. Though, they seem highly motivated, with a high degree of work capacity. They expect to succeed, and work hard to achieve their tasks. It is obvious that there is quite a bit of prestige connected to working in technology-intensive projects, indicating that the employees not only possess a high degree of self-efficacy. A high degree of self-efficacy is closely connected to continuous mastery of tasks, and also related to mastery in the zone of proximal development. In part 2, when presenting theory on self-efficacy, I stated that there was reason to believe that the concept was related to experience accumulation. Findings in the case project indicate that this is the case.

All findings indicate that the members of the project are driven by inner motivation.

*"People in this project are driven by inner motivation, no doubt. You can sense that people here are proud to be a part of this kind of project. They wish to – it is an important project, and if they were only driven by outer motivation they wouldn't work in Statoil on this type of project. They participate in creating something that no one has ever done before."*

*«We don't have a problem with that [motivation among the project members] at all. I think that – there are probably several factors, but one of the main reasons is that this is an incredibly exciting project. It is cutting edge work."*

*"You're working here, but could have done something completely different. You could have worked in the base organization. You choose to go into a project because it's challenging. You are motivated by doing stuff."*

The incentive systems found to be used in Statoil motivated a presumption that the employees would recognize a certain degree of outer motivation, but through the interviews this does not seem to be the case. All statements above support this conclusion.

Through the interviews I found that, on the same line as motivation, mastery was to a large degree well cared for by the members of the project themselves. The project was recognized

by having a set of workers with a high degree of competence and drive in their work. This is consistent with qualities recognized in knowledge-intensive organizations. Alvesson (2004) stated that knowledge-intensive organizations were, among other qualities, recognized by *"Highly qualified individuals doing knowledge-based work, using intellectual and symbolic skills in work"* and *"A fairly high degree of autonomy and the downplaying of organizational hierarchy".* By analyzing motivation and mastery in the organization, this can definitely be said to fit the case well. It is also underlined by a respondent:

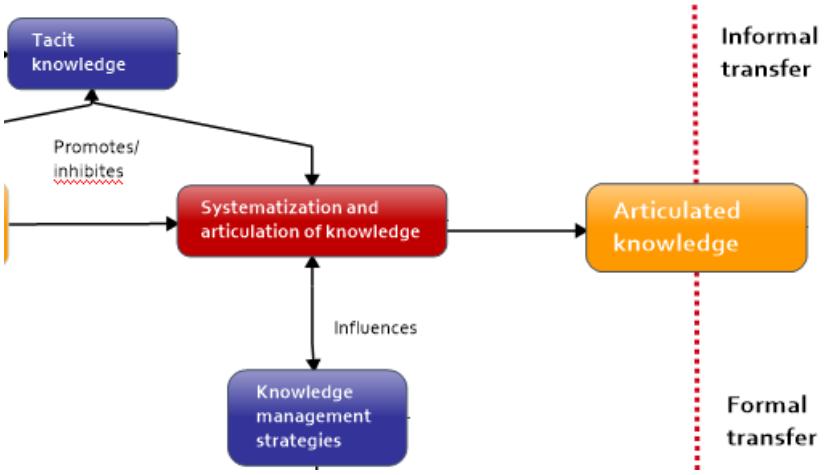
*"We have in this project very qualified people on nearly all functions, and they have a drive to succeed. So … yeah, I feel that they take care of their own mastery. They are almost self-going."*

One respondent summed up what I believe is the core philosophy when it comes to individual learning in the project. Each individual is responsible for their own learning and to make use of the learning arenas, learning systems and support structures that exist in the project, but facilitating these arenas, systems and structures is the organization's responsibility:

> *"Learning? You need to take initiative. Don't sit and wait for someone to shove a compendium or a course session in your hand. You need to be responsible for your own learning. What the organization needs to do is to make sure that there are channels, people, departments and organizations that can help you, but you need to do it yourself."*

Because of a wide array of support systems in place, individual learning processes gain necessary support to function, and individuals also have a greater possibility of developing a high self-efficacy. Whether knowledge gained in the individual learning system and through individual learning processes in experience accumulation is articulated and thus systematized is analyzed further in the next section.

## 12.2 Knowledge articulation




*Model 11.2 – Knowledge articulation system*

The learning mechanism *knowledge articulation* include learning typologies such as learning by reflecting, learning by thinking, learning by discussing and learning by confronting. Typically sought outcomes of this learning mechanism are symbolic representations and communication and improved understanding of action-performance relation (Prencipe and Tell, 2001). The learning articulated in learning processes within learning articulation results in explicit knowledge that builds the foundation for codification processes.

In the process of knowledge articulation, the members of an organization deliberately seek arenas where they together or alone can figure out what works and what doesn't. I found that the case project have a wide system of management systems and report systems. Preceding codification in such systems must be one or several articulation processes. This was also evident through observation of planned and ad hoc meetings, as well as information given by respondents. The individual focus on problem-solving denotes a presence of cognitive processes involved in articulation. If the articulation is done individually, this requires that the individual is conscious of their own learning, thus promoting the *conscious and deliberate* factors of knowledge articulation processes (Prencipe and Tell, 2001). This was also recognized as important by a respondent when asked how to utilize and share tacit knowledge:

*«I think we have to start with each person and make them conscious of their own knowledge and share that knowledge"*

The distinctions between the different learning mechanisms are blurred, meaning that one learning process can be argued to be a part of one or several of the other learning mechanisms. They all draw on each other, indication that one learning system or process can draw on several learning mechanisms. One distinction that can be made is whether the sense-making processes are explicit and deliberate. A higher degree of explicitness and deliberation denotes connections to articulation mechanisms rather than tacit experience accumulation mechanisms (Prencipe and Tell, 2001).

### *12.2.1 Planned and ad hoc meetings*

Knowledge articulation as a learning mechanism is recognized by processes where:

*"…implicit knowledge is articulated through collective discussions, debriefing sessions, and performance evaluation processes. By sharing their individual experiences and comparing their opinions with those of their colleagues, organization members can achieve an improved level of understanding of the causal mechanisms intervening between the actions required to execute a certain task and the performance outcomes produced (Zollo and Winter, 2001)."*

Several learning processes within experience accumulation were recognized by informal person-to-person contact. These informal meetings could be planned or spontaneous. Both planned and ad hoc meetings can be part of experience accumulation or knowledge articulation processes, depending on the level of deliberation and consciousness involved in the learning. This section will analyze the learning processes and learning systems in the case project that was better fitting knowledge articulation than experience accumulation, indicating a deliberately higher investment in learning. There is no doubt that meetings make up a majority of the work-day for many of the members in the case project. Nearly all respondents stated that a lot of their work-day consisted of meetings, especially members on the leader-level.

*"There are a lot of meetings. Something always turns up. Spend a lot of time on that."*

*"My day consists of going to work-meetings, gather engineers, receive feedback from other meetings - make sure that we capture the whole picture."*

#### *12.2.1.1 Department-level meetings*

One of the most prominent planned meetings on the department-level were risk-meetings. The learning system where risks were logged and assessed consists of several different levels, from the individual level to portfolio management-teams, and even potentially the corporate management.

*"Risk is the most important thing we do in a project. To understand what risk lies ahead of us and how we are to handle that risk.*

*"Each group or department has their own risk-meetings where they go through their main risks and what risks they feel that the manager should look at, report etc. Then they nominate their top-ten risks before the project management-meeting."*

These risk-meetings, and the path risks take from level to level, is a part of the systematization and articulation of knowledge leading to articulated knowledge. The risk-system is a part of the learning system of the organization, where they deliberately seek to articulate and codify knowledge connected to their work-situation. It is also connected to typologies such as learning by reflecting, discussing and confronting. The risk-meetings first and foremost promote collective learning. The risk-system and its practical use is also evaluated periodically, thus seeking to enhance established operating routines. Risks are closely connected to operating routines and codification processes, which I will further discuss in the next section.

On the department-level, several other periodical and ad hoc meetings were evident.

*"Every second week we have a department meeting that is normally based on lessons learned and people try to present their biggest failures in their projects, what happened and what they have done to solve it. That is quite interesting. It is normally an eye-opener to understanding other projects."*

While some of the findings point in the direction of experience databases not being used sufficiently, this statement point in another direction. These meetings serve not only as knowledge articulation processes on the department- and project-level, but also as knowledge articulation on an inter-project-level. Utilizing learning across projects have been stated by several researchers as difficult, often resulting in valuable knowledge being lost (Prencipe and Tell, 2001). Meetings such as this are valuable to knowledge articulation as a learning process on both an intra-project and inter-project level. They also focus on the process of working with codification processes, rather than just the outcome.

Ad hoc meetings addressing learning on the department-level has also been initialized in the project:

*"It is important to work with the cooperation culture within your own organization [department in the project], so I called for a meeting internally in our own organization. We had a half-day workshop where we focused on cooperation internally in our own group, and which learning we as a group could make use of."*

The concept of regular workshops to address and articulate learning made in the department is good. It corresponds well with theory, stating that: *"By dialogue and discussion knowledge can be articulated by organisational members and an arena can be created for double-loop learning. (Argyris and Schön, 1978 in Prencipe and Tell, 2001)."* Even though the initiative is good and in accordance with theory, its reception was mixed:

*«The initiative is good, but the effect is low. We are able to set an agenda and put some things on the board, but the effect is low. We have many things to do and it is busy, and then this is nothing but noise. Some people see the importance of doing it, while others do not."*

Reasons for this can be many, but a busy work-situation was stated as the main reason. These meetings and their respective reception are not adequately covered by the data material to draw any further conclusion on the matter. Therefore, I confine in pointing out its theoretical support.

#### *12.2.1.2 Project manager- and project management team-level meetings*

The project management team met once a week to discuss different current issues related to work in the different departments. These meetings were used to coordinate tasks in the different departments, but were also frequently used to discuss current technical issues and risks. Sometimes, the meetings were also used to exchange experiences and assess project routines and systems. While conducting data collection in the case project, I observed one entire meeting devoted to assess the risk-system, and also received information from members of the project management team indicating that evaluation sessions occurred on a regular basis. This indicates that the project manager team invests time in assessing operational routines. Eriksson (2014) indicated the need for a better understanding of how projects could contribute to dynamic capability development from the managerial perspective. Articulation processes in the project manager team such as meeting assessing operational routines and management systems could be a contributing factor in this.

The project manager also participates in team meetings on an inter-project level:

*"On a leadership-level I am a member of a team together with the project manager on Åsgard [the other subsea compression project in Statoil]. So we're a leader-group on those two projects. We try to ensure good utilization of both resources and experiences. So the learning horizontally in our own portfolio is very important that we uncover. At the same time we work towards other projects as well."*

Knowledge articulation processes and knowledge sharing across projects in such teams have the potential of bringing major contributions to organizational learning gains, and thus contributing in the creation of DC on a managerial level. Thus, portfolio-teams serve as arenas where knowledge articulation should be a focal learning mechanism, preferably followed by codification processes to ensure that the learning gains are sufficiently transferred into information that can be further utilized in the organization.

### *12.2.2 Knowledge-sharing networks*

The different project members keep in close touch with co-workers with a similar profession in the base organization through different forums, both digitally and by direct contact. Apart

from extensive use of the support functions/specialists within each profession, several other networks are in place:

*"We have something called material-forum. It is an organization-internal website. There, we post problems and experiences, right? … We also have forum-meetings once a month where we discuss these things. Once a year we have a two-day session for everybody working with material in Statoil. Here, different topics come up. There is a high degree of learning taking place in these sessions."*

One could argue that these forums had their rightful place within experience accumulation as much as within knowledge articulation. However, the knowledge-sharing networks within different professions indicate that learning is a deliberate agenda, even though experience sharing is equally important. In accordance with the previous discussion on the distinction between experience accumulation and knowledge articulation as learning mechanisms, knowledge-sharing networks seem to correspond with the latter because of the deliberation involved. In addition, learning typologies typical for knowledge articulation are evident, such as learning by reflecting, discussing and confronting. An equally important factor of such networks are their community-building effects as part of a CoP. As earlier stated, an individual is a member of numerous CoP in the work-place. With regards to learning theory within the sociocultural learning perspective, knowledge-sharing networks serve both as CoP and also could contribute greatly as a support structure within the individual's zone of proximal development. The statements on knowledge-sharing networks indicate that collective competence in such forums functions as a strong support structure for the individual and a functional CoP in terms of sociocultural learning.

### *12.2.3 Tacit knowledge as part of the articulation process*

Several respondents point towards too much tacit knowledge leaving with people when people leave projects or people leaving the company. Knowledge that they have accumulated during their time in Statoil and that Statoil is paying them to gain, is leaving with the people instead of going through the externalization phase of the SECI-model.

*"It is a big problem to have a lot of consultants like Statoil has. Because most of them have a lot of knowledge and a lot of experience but suddenly they leave. So building a company*

*based on employees and not consultants is helping Statoil a lot. I think we're losing capacity and knowledge by letting them go or even having them as consultants."*

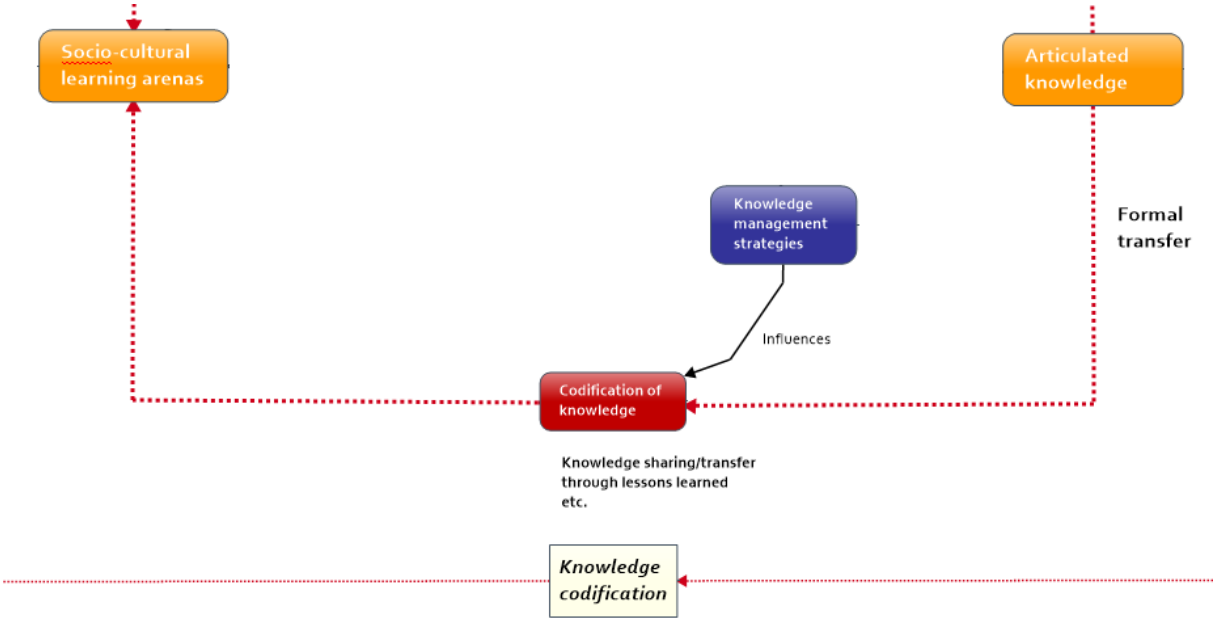
These statements show that using consultants can inhibit part of the externalization-process, and therefore the combination-process shown in the SECI-model. These processes are crucial when aiming to make use of tacit knowledge to promote knowledge articulation and enabling the organization to "access" each individual's tacit knowledge (Nonaka et. al, 2000 in Filstad, 2010).

At the same time, several of the learning systems, learning arenas and learning processes analyzed as part of knowledge articulation are closely related to the SECI-model, where tacit knowledge constructed in the socializing phase (through processes analysed within experience accumulation) is externalized through planned meetings, ad hoc meetings, knowledge-sharing networks, evaluations, workshops and department meetings on different levels. These learning arenas within knowledge articulation fuse the learning processes continuing in the combining and internalization phases. Learning processes found in the combining phase are included in both knowledge articulation and knowledge codification processes. Orally, the group combines the new knowledge with already explicit knowledge through typologies such as learning by discussing and learning by reflecting. When using written combining, the group implement typologies such as learning by implementing, learning by writing and re-writing and learning by adapting. The new knowledge is then internalized at the individual level. This process is in accordance with theory from the sociocultural learning perspective.

## 12.3 Knowledge codification

Knowledge codification is linked to typologies such as *learning by writing and re-writing, learning by implementing*, *learning by replicating* and *learning by adapting*. Typical outcomes of knowledge codification processes are codified manuals, procedures, assessments, knowledge-transfer tools and other written or recorded tools (e.g project management process). In part 2, I presented several questions that could be useful when assessing the use of knowledge codification as a learning mechanism. These were: Have we sufficiently justified the codification process? Are the employees motivated and do they see

the necessity of codifying the knowledge? Will the codified material be taken into use at a later stage? Are the systems for harvesting, editing and using the codified material sufficiently implemented into the organization? I will analyze these questions with respect to the case project. Reflection around the questions could aid in the decision process whether to invest in knowledge codification as a learning mechanism or not. This section relates to the codification system of the conceptual model, but also discusses some of the elements connected to the informal return of the model. The formal return depicting the codification process is shown in model 12.3.




*Model 12.3 – The knowledge codification system*

It early became evident that the project and its mother organization to a large extent relies on the use of knowledge codification processes, some with a clear goal of codifying new knowledge, while some more connected to documentation of tasks and requirements. When functioning largely as a QR-unit, much of the work related to this depended on documentation and codification. As earlier discussed the reporting to and from the tech-department also facilitated a large degree of knowledge codification. This learning system is one of the major contributors to knowledge codification in the project, serving as a massive database made up of specialists in different fields, each relying on a wide array of operational documentation, specs and requirement documentation. When codifying articulated knowledge, the individual or group performing the coding will have to reflect on

what works and what doesn't. This can in return facilitate the generation of new ideas and better, more efficient solutions and operating routines. "*Codification, therefore, is potentially important as a supporting mechanism for the entire knowledge evolution process, not just the transfer phase (Zollo and Winter, 2001).*

The codification systems found in the case project were numerous, and all respondents made use of a wide range of documentation systems and documentation processes in their work.

*"We have a risk system. So we document all actions and results. Then we have a monitoring system that defines – If we do a follow-up on something, we're supposed to relate it to a risk and why we do it. Then we're supposed to document it. When it comes to handling contracts, we formalize it either by numbering the mails or letters. This way we keep traceability all the way. Then we have quality databases where we seek to catch everything that is of bad quality. Re-work, errors and such. Then we catch it in main data bases [such as Lessons Learned and tech-department]. So we have a lot of systems and different systems."*

An important question put forth in the beginning of this section was *"Will the codified material be taken into use at a later stage?"* In intra-project learning, the project and its members were very much utilizing codified material both from the tech-department, through documentation of tasks, actions, requirements, documentation from subcontractors, risk-assessment systems and in seeking to secure traceability in the project progress. At the same time, some of the codification processes, especially related to knowledge transfer and experience-logging, were somewhat controversial in their use. Here, the utilizing of existing systems was ambiguous, leaving several of the questions put forth in the beginning of the section open to multiple answers.

One of the statements put forth in several of the interviews was that "*you're allowed to make mistakes, but you are not allowed to make the same mistake twice".* By this, the respondents meant that it was important to make an effort and try to solve something, but when you found a solution or made a mistake, it was important to make sure that it was

codified and documented. This was elaborated by underlining the importance of being traceable in all aspects of the work.

*"We try to make sure that, all along, we have worked so that we are traceable in what we do. By that, no one is allowed to keep the knowledge for themselves – not document what they do and why they do it. It is a way of catching that knowledge, catching what they have done and catch the learning."*

Traceability through such systems seem very valuable as a knowledge-sharing system, making it possible to follow past learning processes by following the "trail" left behind by the individual or group carrying out the tasks. This is closely connected to typologies such as learning by replicating, where one can follow what has already been done, and replicate the best practices. At the same time it was clear that there were challenges connected to codification processes and the traceability of the project and its members.

*«We should be better at making experience assessments as we go, and not wait until the end. I have asked the project to do some experience assessments along the way, and improve our traceability in what we do. I think that one can get the experience data at the end, without having to do a lot of work."*

This was backed up by another respondent:

*"We have experience databases, for instance close-up reports and experience reports from each project. The good projects – we're currently not good enough when it comes to this – but the good continuously log their experiences so that all that is left is to do some re-writing and summing up at the end, while we will need to stay behind after project completion to make the summary. I fear that we will have forgotten the most important parts by then, if you know what I mean."*

This point is important both when looking at the *outcome* and the *processes* involved in codification. One of the main goals of codification processes are to process knowledge into information codified by written and/or digital tools, thus making the information possible to transmit and share in the organization. (Prencipe and Tell, 2001). This is the *outcome* of the processes involved in knowledge codification. However, Prencipe and Tell (2001) states that:

*"The process aspect of knowledge articulation and codification seems to have been neglected in the existing research, which tends to focus more on the outcome and the economic benefits related to such outcomes* (ibid)*."*

Thus, a focus solely on the outcomes of the codification leaves out the potential positive knowledge-gaining effects of the *processes* involved in codification. This is also one of the focal messages of this thesis. Knowledge codification has the potential to bring learning by itself, because by producing, editing and updating codified material, there is a potential of gaining a higher understanding of the material in question.

> *"… besides the substantial cognitive investment in the learning by writing and re-writing suggested by Zollo and Winter (2001), organisations learn by implementing, replicating and adapting codified knowledge (Prencipe and Tell, 2001)."*

Statements made by the project manager and members of the project indicate that the case project miss out on some important learning synergies by not sufficiently logging their experience and learning along the way. Thus, the typologies of writing and re-writing loses some of their function.

### *12.3.1 Management systems*

In the analysis of knowledge articulation processes, risk-assessments were recognized as one of the most important parts of the project process. Its value as one of the leading management systems, and thus codification systems, were recognized by several of the respondents. It is vital to the project process that risks are identified, and handled accordingly. As stated earlier, one of the project management meetings observed was a meeting devoted to evaluating the risk-system. One of the main conclusions was that:

*"… we define too many risks. People use it more as a reporting system than a management system."*

In the context of change excess codification can stifle the development of new knowledge and inflict stability and inertia on systems (Prencipe and Tell, 2001). The reason for this is that by defining too many risks, the project and its members have a hard time defining what is important. Thus, the real risk is that the areas that should be given focus is overlooked, disabling the potential of developing new knowledge on the most important areas. The

traceability of each risk entry should therefore be improved. This had already been identified by the case project as important:

*"We have updated the system, so now we can mark the risk, click on "experience", and it turns into an experience entry in the data-base. Then you have a link between the risk, what we did and are able to define it as an experience."*

### *12.3.2 Documentation and reporting*

Within both of the preceding learning mechanisms I have discussed the importance of the tech-department as a support system and learning system of its own. The learning processes involved in communication with the tech-department are focal in all three learning mechanisms, thus also in codification processes. When asked whether new knowledge, learning gains and new solutions were reported back to the tech department, one respondent stated that:

*"It is reported back. And it is reported back both because they need to understand what has been done according to learning and such and also because they participate in documenting, verifying and approving the results."*

As stated in chapter 10, the tech-department makes sure that requirement documentation is constantly updated to match what is done in the projects. Within the codification debate, this type of system seems highly effective. There are some potential downfalls to the system though; one being that the tech-department is a secondary source when updating documentation and requirements. One is still dependent on the primary source – the project – sufficiently codifying their knowledge gains. If the project members fail to be sufficiently clear in their codification, the knowledge gains are overly open to interpretation.

### *12.3.3 Knowledge transfer*

Organizations face challenges when seeking to catch and distribute knowledge. It is hard to transfer knowledge from one project to another, and this often leads to valuable knowledge being lost (Prencipe and Tell, 2001). The knowledge transfer systems, their use and perceived efficiency were revealed as controversial and a subject of discussion in the case project and its mother organization. All respondents stated that the knowledge transfer

systems and current practice was not optimized. In addition, it seemed that the ideas and thoughts of the respondents were in mismatch to the management strategy choices of the mother organization written in the governing documentation that guides the project. Section 1.5 states that I chose to limit my research to the project itself and only to a small degree discuss inter-project learning and how the knowledge is transferred from the project to the mother organization. At the same time, I stated that the subject were to be presented and discussed where it served the purpose of showing the whole picture of learning systems, because the link between intra-project learning and inter-project learning is very much present, and cannot be overlooked completely (Swan et al., 2010). These systems need further elaboration in the context of knowledge codification, where they are important not only as inter-project transfer systems, but also as intra-project knowledge transfers systems and important *processes* related to learning by writing and re-writing. Several respondents identified inter-project knowledge-transfer as one of the main Achilles-heels of the company:

*"We can't … we complete projects, but then we struggle to get the knowledge into the new projects, into the base units, into … well, into the organization. That is really what Statoil is struggling with."*

*«When we have gained the experience it isn't brought back into the next project. That is what has been the obstacle in this company."*

One of the main experience databases used by Statoil is Lessons Learned. When discussing knowledge transfer, the question arose whether Lessons Learned was used the way it is intended. One respondent stated that:

*"We're not sufficiently able to do that in Statoil. On some contracts we have started to catch events and learning continuously in that type of database, but other contracts such as this project have logged two entries over the last four years. Learning points. What we see is that in a busy work-day we sort of "sure, there is a lot of learning", but it isn't systematized so that we can catch it sufficiently."*

The use of Lessons Learned is clearly a controversial subject among the members of both this and other projects. It is clear that all respondents are aware that they are expected to log events and learning continuously, but it is not always done.

A possible solution put forward by several of the respondents, were to simplify the knowledge-transfer processes to the degree that the synergies produced more than justified the time invested in conducting them. It has been argued that the benefits of high quality formalization produces synergies that could more than offset the initial costs (Prencipe and Tell, 2001, Zollo and Winter, 2001). It is not merely enough that the production of synergies are shown though the base line. Two questions presented in the beginning of this section were: "*Are the employees motivated and do they see the necessity of codifying the knowledge?"* and *"Have we sufficiently justified the codification process?"* If the answer to the questions are "no", then economic gains are relatively insignificant. The organization still run the risk that the learning output is low. Case findings indicate that the necessity and value of the logging is not always evident.

*"I have on several occasions written close-up reports. They are typically 30-40 pages. Not a single soul has read them."*

This statement is also closely linked with the question: *"Will the codified material be taken into use at a later stage?"* However, I found that processes have been initiated to create such synergies and implement routines:

*"On some contracts – nearly before they set contract, they collected a lot of experiences and used the experience databases on related projects. Then they collected a lot of experience and data. If we follow our governing documentation, then we're supposed to produce documentation when we close a project, and collect when we open one. Do we do it? No. Not all projects. If we did, we would have gained a lot from it."*

In the theory section of this thesis I stated that an important potential downfall when using resources on knowledge codification, is that employees don't use the manuals and documentation created. They simply go through the process of codifying because they are told to do so, not taking into account that the codified material also needs to be taken into use for the initial costs to pay off. The statements above point in both directions – both that codified knowledge-transfer material are taken into use and seen as valuable in later stages of both intra-project and inter-project learning, and that it is not sufficiently used to justify the investment put into them. The first is linked to a realization of the learning typologies

*learning by implementing* and *learning by replicating,* while the latter fail to promote such learning typologies.

Another possible solution in the attempt to forward knowledge-transfer and inter-project learning presented by several of the respondents were to deformalize the knowledge-transfer phase and recognize that the value of tacit knowledge lies within the individual rather than seeking to make it available only through knowledge codification. Thus, they urge the use of more knowledge articulation and informal knowledge-transfer, but especially to increase specialization in order to create "expert" field-environments.

*"This is what we have started doing. We define some portfolios that will be working with specific fields. It is the way we start to define our matrix in relation to tasks. For instance, we have a field environment here in Bergen that will handle all topside modification projects."*

*«If we all worked together on the next project, next time we would know all the bloopers we did on this project. Just drive them into the next project, copy/paste. Don't have to do any engineering what so ever. Just suit up and go."*

*"Really, it's the person and the relations between people, the experiences they possess. That's where you can do it. Re-usage of that. I think that is much more important than reading it in a data-base."*

*"It [knowledge codification] is the good intentions, but we're not able to conduct it. What we should do is – we need to allocate people. Those who have worked with projects like this one, they need to be defined within a group".*

By this, the idea would be to create a group that "owned" the tacit knowledge through forwarding CoP and community-building effects, thus making sure that the group has the knowledge. By this. Knowledge articulation processes become more important in creating collective knowledge than knowledge codification processes. In that way, an individual could leave the group without the group "losing" the tacit knowledge of the individual. At the same time, one runs the risk of creating individual experts on particular fields of work, because in a project one often find just one employee on a particular field of work.

# Part 5 : Conclusion and further research

## 13 Conclusion

### 13.1 Answering the problem statement

The purpose of this thesis was to explore the following problem statement:

***"How are learning mechanisms used in the creation of an organization's dynamic capabilities in knowledge-intensive project organizations?"***

By this, the goal was to explore the processes *thought to constitute* the development of dynamic capabilities. I chose to explore three learning mechanisms identified by Zollo and Winter (2001) to greatly influence the creation of dynamic capabilities by analyzing the learning processes and learning systems found in a knowledge-intensive project organization. The three learning factors are *1) experience accumulation, 2) knowledge articulation* and *3) knowledge codification*. The thesis is founded within the sociocultural learning perspective, which views learning as fundamentally social and context-related. In addition, I motivated a slightly heightened focus on individual learning. The three research questions related to the problem statement were:

1. *Which learning arenas and learning perspectives were most evident in the project?*
2. *What role plays individual learning in intra-project learning in knowledge-intensive organizations?*
3. *Which learning processes and learning systems can constitute the different learning mechanisms in knowledge-intensive project organizations?*

When analyzing empirical data to answer research question number one, I found that the sociocultural learning perspective had a wide applicability on the case project, together with several theories related to the cognitive perspective. Several findings indicated that situated, practical, informal processes were acknowledged as the main path to learning. Learning was something that, first and foremost, happened in the work situation itself. Though it seemed evident that learning to a large extent was initiated at the individual level, it was also stated that learning was both initiated and took place at social arenas at the team level.

I found that members of the project made use of a variety of support structures to aid their problem solving. These structures included mentors, co-workers, tech-department/specialists and documentation through databases, but only to a certain degree made use of experience-databases. Thus, it can be concluded that members of the project largely facilitate problem-solving and experiential knowledge-gaining through social learning arenas. This indicates that a wide variety of organizational support structures are in place, giving the individual the possibility to optimize his/her zone of proximal development, but it is still the responsibility of the individual to make use of the support functions.

Even though some of the critique of applying the sociocultural learning perspective on a project found support in the empirical data, the majority of data analysis pointed in the direction that key theories within the sociocultural learning perspective are widely applicable to knowledge-intensive project organizations of this magnitude. Key factors of CoP, as well as stable membership, shared goals, psychological safety, mutual trust and also collective or group-level reflection were factors evident in the case project. Thus, the critique did not find sufficient support to undermine the foundational focus of the thesis.

This thesis' somewhat heightened focus on individual learning was motivated both by two presumptions. The first being that individual learning would be extensively found in an engineer-environment and the second being that engineer-environments are recognized by a high degree of problem-solving, often at the individual level. Through the analysis made on the different learning mechanisms, I have found that *individual learning is a very important factor of learning in knowledge-intensive project organizations.* This seems especially true for projects with a high engineer-density, promoting the validity of my presumption and preliminary focus on individual learning in the conceptual model. Most members of a knowledge-intensive project recognized by a high level of technological development seem to be highly motivated by the sheer nature of the project. By being highly motivated, they also possess a high degree of self-efficacy, making them able to define their own zone of proximal development and evaluate their own level of mastery in the processes involving individual learning. This individual learning is recognized largely by its informal nature and strong use of support structures, thus forwarding experience accumulation in social contexts

even if the individual tacit learning initiates the learning process. In this type of learning system individuals make use of mentors, specialists and person-to-person contact to enhance their own learning and help them solve the task at hand. Typologies such as *learning by doing* and *learning by using* were found to be preferred by the members of the case project in every-day practice where learning was not the focal and conscious goal of the problem solving. Improvisational and experiential learning is thus evident together with an accumulation of individual and collective tacit knowledge. This is clearly related to experience accumulation processes and the socializing phase of the SECI-model. These conclusions serve to answer research question number two.

Research question number three was in many ways the focal question for the analysis of the thesis. Its goal was to explore which learning processes and learning systems constituted the different learning mechanisms in the case project.

Learning processes and learning systems constituting e*xperience accumulation* in the case project have already been subject to conclusions through answering the two previous research questions. Especially processes of individual and person-to-person experience accumulation in the framework of the sociocultural learning perspective were focal processes in experience accumulation, as well as the foundational learning system. Knowledge sharing was extensively used in the project, primarily through informal channels such as informal meetings, or through spontaneous person-to-person contact. The members of the project had a clear understanding that it was important to contact each other when they needed help to solve a problem. At the same time, I found that some of the respondents were unsure who to contact when facing a problem. A difference in answers showed a relation between the level of one's own experience and the wish to formalize tacit experience through for instance arranged sessions of databases with information on each employee. Younger and more unexperienced members forwarded the wish for higher formalization. Findings also indicated that there were still unreleased potential in making sure that the members of the project knew who to contact when being faced with a problem.

The case project also made use of a number of processes and systems related to *knowledge articulation.* Learning processes and learning systems constituting this learning mechanism were especially related to planned and ad hoc meetings on different organizational levels. Individual learning processes were also evident within this learning mechanism, containing a higher level or deliberation when articulating knowledge and learning than in experience accumulation. Risk-meetings were the most prominent planned meetings on the department-level. They were also important on the project management-level. On the inter-project level, the project manager participated in learning arenas and knowledge-sharing networks together with project managers from other similar projects. Portfolio-teams serve as arenas where knowledge articulation should be a focal learning mechanism, preferably followed by codification processes to ensure that the learning gains are sufficiently transferred into information that can be further utilized in the organization. Knowledge-sharing networks were also present within different professions, both digital forums and in groups. Findings indicated that learning was a deliberate agenda, even though experience sharing was equally important. An equally important factor of such networks was their community-building effects as part of a CoP. Findings on knowledge-sharing networks indicate that collective competence in such forums functions as a strong support structure for the individual and a functional CoP in terms of sociocultural learning.

The last learning mechanism that has been explored is *knowledge codification.* The codification systems found in the case project were numerous, and all respondents made use of a wide range of documentation systems and documentation processes in their work. The risk-system was central also to knowledge codification. The system was currently undergoing changes to include easier transfer between the risk-system and the experience database. With the risk-system having such a focal part in both knowledge articulation and knowledge codification, creating an efficient link to experience logging seems of high value to the codification process. The learning processes involved in communication with the tech-department were focal in all three learning mechanisms, thus also in codification processes. Reporting and documentation going to and from the tech-department facilitated a substantial degree of knowledge codification. The tech-department made sure that requirement documentation was constantly updated to match what was done in the projects based on codified material reported from the projects. Thus, learning entries were

constantly made in the tech-department. Traceability was a key concept in knowledge codification processes, indicating a focus on the importance of documenting processes and solutions involving learning. In a process of keeping traceability, articulation processes are also very much present. Findings also indicated that there was room for improvement when striving to keep traceability. This was especially evident within experience logging and codification in knowledge-transfer processes.

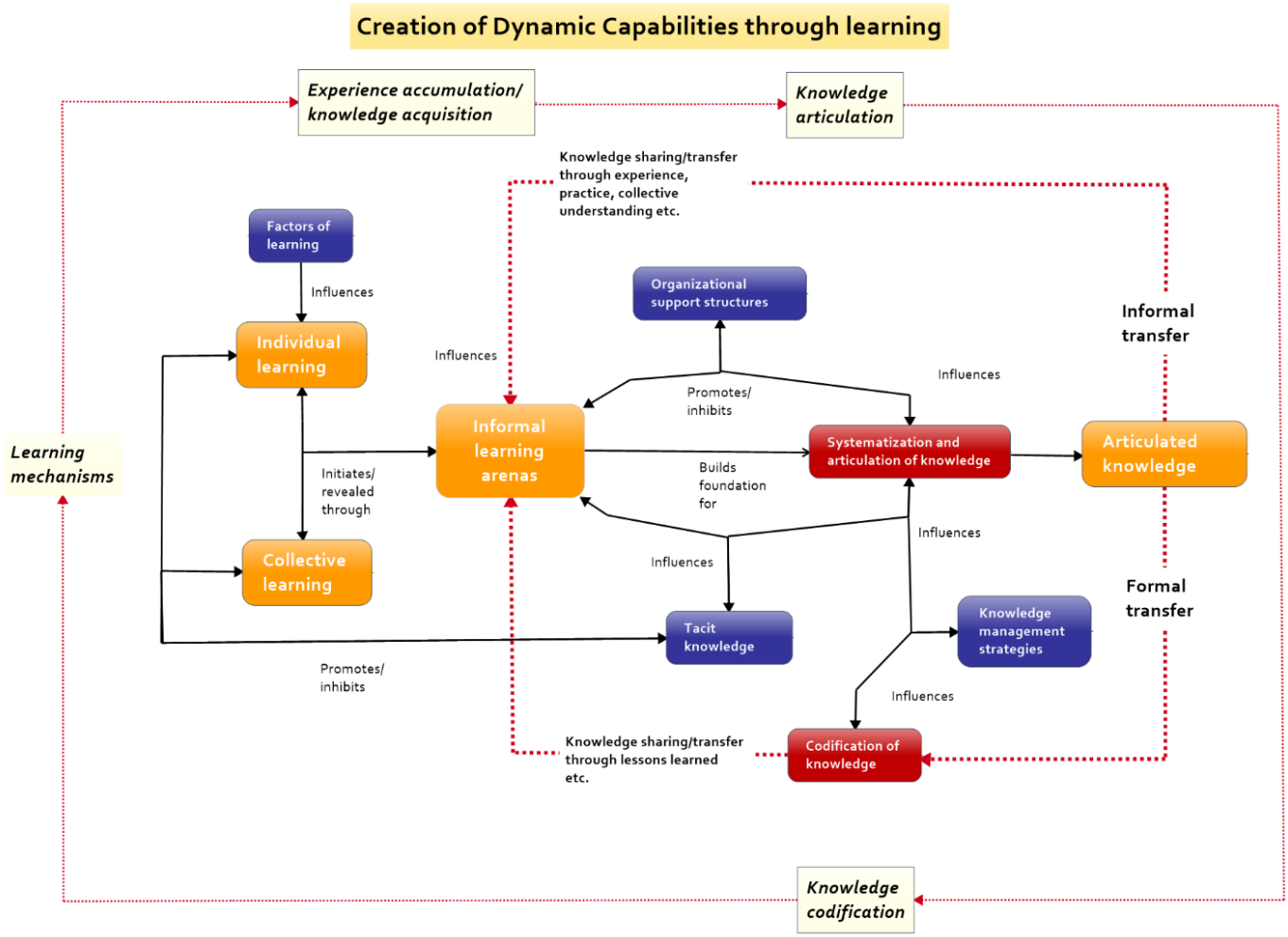
Findings indicated that the case project missed out on some important learning synergies by not sufficiently logging their experience and learning in experience databases along the way. A focus on the outcomes of the knowledge-transfer codification can leave out some of the potential positive knowledge-gaining effects of the *processes* involved in codification. Thus, the typologies of writing and re-writing lost some of their function. On the topic of knowledge transfer processes, ideas and thoughts of the respondents seemed to be in mismatch to the management strategy choices of the mother organization. It was clear that all respondents were aware that they were expected to log events and learning continuously, but that it was not always done. One reason motivating this dissent seemed to be that the knowledge-transfer systems were overly cumbersome it their use, not fitting the busy work-environment recognizing a knowledge-intensive project operating in heterogeneous and fast changing environments. One solution put forward was to simplify the systems to better fit the environment of such projects. The knowledge-transfer process was recognized as valuable to the project members even though the current tools were not seen as sufficiently practical and effective. Another solution that harvested support among the members of the case project was to decrease formalization and increase specialization. Thus, they urged the use of more knowledge articulation and informal knowledge-transfer by creating a group that "owned" the tacit knowledge through forwarding CoP and community-building effects.

The conclusions above show which learning processes and learning systems can make up the three learning mechanisms in knowledge-intensive project organizations. Further, it reveals which processes and systems that are believed to be functional and which challenges a knowledge-intensive project organization can face when facilitating and making use of

different learning mechanisms. Finally, it indicates how these processes and systems facilitate the creation and utilizing of learning and knowledge in a knowledge-intensive project organization in the pursuit of dynamic capabilities. Based on the analysis, it seems that members of a project with a high degree of engineer-density and technological development are conscious of how they work to learn and not the least to succeed. They are also driven by a high degree of self-efficacy and inner motivation. Even though learning is very much present, learning processes are not given much conscious focus due to the large degree of focus on problem-solving and the tasks at hand. Learning systems and processes within experience accumulation and knowledge articulation were most used and appreciated by the members of the project, while the organization seem to promote a higher focus on knowledge codification. The case project and its mother organization face challenges on certain areas in utilizing tacit knowledge and promoting efficient inter-project knowledge-transfer. There seems to be a dissent between what the organization wants (knowledge codification and formal transfer) and what the employees sees as most valuable when promoting learning (knowledge articulation and informality). This could indicate that members of knowledge-intensive projects with a high degree of technological development rely more on informal communication and less time-consuming knowledge processes. This is in accordance with characteristics of knowledge-intensive firms put forth by Alvesson (2004).

Even though the case project face some challenges on certain aspects within the learning mechanisms used, the case show that a knowledge-intensive project of this magnitude effectively facilitates and makes use of all three learning mechanisms, showing clear signs of dynamic capability development. There is definitely a high degree of learning taking place, and the project members are highly capable of facilitating their own learning. The project also show clear signs of dynamic capabilities being present, with a will and desire to systematically and constantly generate, change and improve its competences and operation routines in pursuit of improved effectiveness.

## 13.2 Revising the conceptual model




*Model 13.1 – Revised conceptual model*

In the original model, individual learning was seen as a process mainly following the initiation of learning through sociocultural learning arenas. Though this was not found to be fundamentally wrong, it seems more accurate to portray the initiation of learning as coming *from* individual learning *to* informal learning arenas. The label *informal learning arenas* more accurately describes the type of learning arenas found within experience accumulation processes. Collective learning is also a factor found to be initiated by, and revealed through informal learning arenas within the same learning mechanism. The organizational support structures were found to be of great importance to informal learning arenas, thus shown in the model to promote or inhibit these. Tacit knowledge was found to be of importance to all parts of the ambient learning system in experience accumulation. Tacit knowledge is also

highly relevant to learning in informal learning arenas, where it is brought into the learning arena by the individuals performing the learning. These arenas do not have to indicate social learning, but can also consist of individuals learning by making use of the appropriate organizational support structures.

The focal message of the learning system encircling informal learning arenas is still that learning is mainly developed and initiated in such arenas, and that these arenas are context-related and situated. Therefore, articulated knowledge is brought back into these arenas of learning through both formal and informal transfer. The "new" articulated knowledge is revealed, first and foremost, through these learning arenas. This is in compliance with the sociocultural learning perspective, recognizing the informal learning arenas' validity as the foundation for learning in knowledge-intensive project organizations and acknowledging the conceptual model's depiction of this through empirical analysis.

The concluding analysis made in the previous section show that the other factors and systems of the original conceptual model were widely supported by empiricism. Thus, these factors and systems of the model and their respective relationships remain unchanged. This leads to the conclusion that the initial conceptual model found wide support when explored through empiric analysis. Its validity in depicting learning processes and learning systems thought to constitute the three generic learning mechanisms is thus strengthened, showing that the original model and its respective theory are highly relevant to learning processes and systems in knowledge-intensive project organizations.

# 14 Implications and further research

## 14.1 Theoretical implications and further research

The conceptual model of the thesis showed to be well anchored in empiricism based on data from the case project, though with some important revising. The presumption that individual learning was extensively found in knowledge-intensive project organizations was also found valid through the empirical analysis. It is highly probable that the different learning processes and learning systems found in the case project to constitute the three learning

mechanisms only constitute some of the numerous processes and systems used in this type of project organization. Thus, further studies should be conducted in other organizations in order to explore the analytical theories presented in this thesis. This would contribute to a greater understanding of how knowledge-intensive projects can contribute to organizational learning and the development of dynamic capabilities.

When creating the topic and limitations for this thesis, I have made some tough choices regarding topics to include and exclude. Many potential relevant topics were excluded, and among these were the topic of *assessment.* There is a clear tendency that organizations move more and more towards goal oriented measurement systems, where both individual and organizational goals guide all aspects of the organization. These goals need to be assessed and evaluated. Evaluation is widely found in organizational theory. Formative assessment (assessment *for* learning) is a field widely studied within the pedagogical discipline, but not widely found within organizational and project-management theory. Even so, it can have a wide applicability in a study of what affects learning in project organizations. Extensive research has been done on the effect of formative assessment in the education sector, revealing that *"Innovations that include strengthening the practice of formative assessment produce significant and often substantial learning gains"* (Black and Wiliam, 2010). It would be very interesting to analyze how the project manager and middle managers facilitate and conduct assessment, and especially formative assessment, and how this affects the learning both at an individual and collective level. Such studies would be extra interest as this thesis have revealed that such environments rely heavily upon individual learning, and that highly motivated personnel and a high degree of autonomy are involved in such learning.

In the conclusion, I stated that there seems to be a dissent between what the organization wants (knowledge codification and formal transfer) and what the employees sees as most valuable when promoting learning (knowledge articulation and informality). Further, I stated that this could indicate that members of knowledge-intensive projects with a high degree of technological development rely more on informal communication and less time-consuming knowledge processes than formal knowledge codification processes. This finding is in need

of a wider research base in order to undergo further generalization, and should therefore be the subject of further studies. By conducting similar studies in other projects with the same characteristics, one would gain a higher knowledge on the validity of these indications. Also, studies done in other type of knowledge-intensive project organizations operating in other environments would further the research base even more. This would lead to a deeper understanding of the learning mechanisms most efficient for different types of knowledge-intensive project organizations, creating positive practical synergies for organizations utilizing such projects.

## 14.2 Implications for the case project and mother organization

The thesis uncovered that there is unreleased potential when it comes to learning gains in the case project, especially when utilizing and transferring gained knowledge and making use of the *processes* involved in codification. The focus seems to be mainly on the outcomes, under-focusing on typologies such as learning by writing and re-writing. The members of the project are highly qualified and able to facilitate their own learning, and necessary organizational support structures are in place. Even so, there is a clear dissent between what the organization sees as important to enhance learning transfer and knowledge sharing, and what the project-members view as important. A considerable amount of resources are put into knowledge codification processes, while there is reason to argue that the project members view some of the knowledge articulation processes as more important for project success. It is important to underline that this is not the case for all codification processes, for instance management- and intra-project report systems, but seems to be the case for many of the inter-project codification demands enforced by the mother organization. On the same line as the statements in the previous section, there is also reason to believe that the organization should consider a company-internal study related to why this thesis revealed a fairly substantial difference between theory and practice concerning inter-project learning. It is obvious that a substantial amount of time and resources have been placed into codification processes in the organization, thus establishing a substantial codification structure. To conclude that this structure works inadequately based on one single case study would have very little validity. Therefore, to establish a better fundament for generalization, further research should be made.

The possibility for reorganizing and forwarding ideas from the sociocultural learning perspective seems relevant for Statoil, meaning that projects to a higher degree could benefit from being organized more towards team-organization, largely drawing on theories related to CoP and community-building effects. This supposes a higher degree of specialization. Several of the respondents, especially on the leader level, spoke warmly about increased specialization among employees working in projects, as well as a further detachment of the project organization from the mother organization. Statements concerning this were presented in chapter 13. It would be very interesting to see if increased specialization lead to an increase in learning, more efficient use of knowledge and ultimately an increase in DC. Could increased specialization and the use of the same work force from project to project lead to more harmonic teams? Could it lead to teams that had a more efficient use of their learning systems and codification systems?

A last point needs to be made regarding Statoils incentive system *People at Statoil.* When collecting data for this thesis, I uncovered that the system is clearly controversial in its use. All respondents pointed out that it is not working optimally, some also stating that is was faultily based. This thesis only scratches the surface of PaS, because incentive systems, recognition and reward are beside what the thesis mainly studies. A study regarding the outcome of PaS, whether it works according to intention and how it affects factors such as motivation and mastery could be of great interest to the company, with the potential of creating efficiency gains for the organization and its employees.

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## Appendix

# Intervjuguide prosjektdeltakere

- Takke for at vedkommende tok seg tid
- Generell presentasjon av meg og hva formålet med intervjuet er.
    - Navn
    - Utdannelse og om HHB
    - Skal samle data til Masteroppgave som skal inn i juni
- Presenter kort de fire temaområdene spørsmålene omhandler
    - Generelle spørsmål
    - Prosjekt og team
    - Samarbeidskultur og taus kunnskap
    - Læring
- Forespørsel om bruk av båndopptaker.
- Anonymisering, bare meg og veileder som har tilgang til lydfilene. Dei blir sletta etter transkribering.
    - Intervjuobjektet kan til ei kvar tid velg å la være å svare på spørsmål eller avbryte intervjuet.
    - Legg frem samtykkeerklæring, kan skrive under etter at intervjuet er gjennomført.

***Tema 1: Generelle spørsmål***

Begynne med å fortelle om egen jobb, arbeidsoppgaver, utfordringer og muligheter

1. Stilling
2. Hvor lenge har du vært tilsatt?
3. Kor mange prosjekt har du deltatt på i Statoil?
4. Har du hatt samme rolle i alle prosjekt?
5. Deltar du nå ekslusivt i GSC? Hvor lenge ser du for seg at du skal delta i GSC?
    a. Ser du på dette som positivt, eller negativt?
6. Fortell om din rolle i GSC, arbeidsoppgaver
7. Hvordan ser en typisk arbeidsdag ut?
8. Hva har vært store utfordringer for deg og ditt team siden prosjektstart? Hvorfor?
    a. Hvordan løste dere disse utfordringene?
9. Hvordan vil du definere følgende begrep:
    a. Læring
    b. Motivasjon
    c. Mestring

d. Taus kunnskap
e. En god samarbeidskultur
f. En lærende organisasjon

***Tema 2: Prosjekt og team***

1. Hvordan velges prosjektdeltagere i prosjektene til Statoil?
2. Før prosjektet starter, har dere møter der andre som har vært borti lignende prosjekt forteller om sine erfaringer?
3. Begynte alle samtidig i prosjektet?
4. Hadde dere noen innledende kursing eller lignende før prosjektet startet opp?
5. Vil alle forlate prosjektet på samme tidspunkt?
    a. Hvordan forventer du i så fall at kunnskapen din skal fanges opp på slutten av prosjektet?
6. I hvilken grad synes du at kunnskapen fra dette prosjektet er relevant/nyttig for andre prosjekt?

**Medarbeidersamtale og evalueringer**

7. I hvilken grad finner du medarbeidersamtaler og evalueringer nyttig?
8. Gjør dette at du blir mer eller mindre motivert for arbeidet ditt? Hvorfor/hvorfor ikke?
9. Evaluerer du prosjektleder og/eller din nærmeste leder?

***Tema 3: Samarbeidskultur og taus kunnskap***

1. Har dere noen form for teambuilding når prosjektene starter?
2. Hvem er den første du går til når du lurer på noe?
3. Arbeider man i stor grad sammen, eller blir arbeidet utført individuelt for så å rapportere i fellesskap?
4. I hvor stor grad er teammedlemmene spesialiserte i sine roller?
5. Hva kan de si om teamdynamikken? Er man innlært til å ta hverandres roller om nødvendig? Bytter de på roller for å være i stand til å ta over for de andre?

**Taus kunnskap**

6. I hvor stor grad er du bevisst dine medarbeideres tidligere erfaringer?
7. Blir taus kunnskap tatt med i forkant/underveis i prosjektet?
8. Hva er de største fordelene og ulempene med teamoppbyggingen?

**Arbeidshverdagen og kunnskapsdeling**

9. I hvilken grad synes du at du kan styre din eigen arbeidshverdag?
10. I hvilken grad deler du kunnskap du tilegner deg med kollegaer?
11. Hvor motivert er du til å sette deg ned, underveis eller på slutten av prosjektet, og reflektere over erfaringer og dokumentere kunnskap som dere har lært?
12. Hvordan arbeider man for å løse utfordringer?

***Tema 4: Læring***

1. Hvordan lærer du best?
2. Hva kan en avdelingsleder/prosjektleder gjøre for at du lærer best? Kan de gjøre noe?
3. Snakke om:
    a. Motivasjon – Hva motiverer?
    b. Mestring – Hva legger informanten i ordet? Hva er mestring?
    c. Formativ vurdering – Funksjonelt? Blir det brukt? Mulighetsorientert eller problemorientert?
        i. Eller er de rett og slett selvdreven?
    d. Relasjon mellom medarbeider og nærmeste leder
        i. Hvor viktig tenker du dette er?
        ii. Vil du si at dere har gode relasjoner innad i teamet og prosjektet generelt? Kan alle si meningen sin?
4. I hvor stor grad blir du oppfordret til å innhente ny kunnskap?
    a. I hvor stor grad bruker du tid på det? Kun når det er nødvendig, eller også uten at det er et konkret problem som skal løses?

**Læring i kraft av å være ingeniør**

1. Hva gjør høy utdannelse med egen læringsprosess?
    a. Veldig bevisst på hvordan de lærer best?
2. Hva forventes av egen læring? Hva forventes av arbeid i team?
    a. F. eks: Du trenger å sette deg inn i ny teknologi pga et problem som har oppstått – hvordan lærer dere om denne nye teknologien? Må dette gjøres selv?
3. Er det bare problemer/utfordringer som man lærer av/som løses i team, eller er det også andre arbeidsoppgaver?

**Læringsmekanismer og læringslandskapet**

1. I hvilken grad blir det satt av tid til møter for innhenting av lært kunnskap underveis i prosjektet?

2. Hva er Statoils nåværende strategier for å overføre kunnskap fra tidligere prosjekt?
    a. Blir dette brukt (f. eks Lessons Learned), eller er det mest for å vise at det blir gjort? Bruker du dette i starten av nye prosjekt?
3. Vil du si at Statoil er en lærende organisasjon? Hvorfor/hvorfor ikke?
4. Hvor tenker du at det foregår mest læring i prosjektet? Hvilke arenaer deltar du på der mest læring foregår?
    a. Kan uformelle samtaler være like gode som formelle? Hvordan kan man registrere læring fra uformelle samtaler?
5. Er det vanlig å hente erfaringer fra andre, som ikke er med på det aktuelle prosjektet?

**Dynamic capabilities**

1. Adaptive capability
    a. Hvor stor grad av frihet har medarbeiderne til å finne nye løsninger? Gjøres dette kollektivt, eller er det mye individuelle initiativ?
    b. I hvor stor grad kan medarbeidere utfordre etablerte måter å gjøre ting på?
2. Absorptive capability – Absorbere ekstern info, integrere og bruke den i egen virksomhet
    a. I hvor stor grad henter man lærdom/teknologi fra andre selskap? Hvem blir sett på som «best i bransjen»?
        i. Spesielt fokus på om man henter kunnskap fra samarbeidsbedrifter
    b. Implementere begrepene « knowledge aquisition, assimilation, transformation and exploitation" i intervjuet

# Intervjuguide prosjektleder / teamleder

**PS: Tillegg til intervjuguide prosjektdeltakere**

***Tema x: Prosjektledelse***

1. Hva blir gjort for å fange opp kunnskapen til en person når noen forlater prosjektet?
    a. Blir det samme gjort underveis som på slutten av prosjektet?

2. Er det vanlig å hente erfaringer fra andre, som ikke er med på det aktuelle prosjektet?
3. Hvordan er fremgangsmåten ved start av nytt prosjekt?
4. I hvor stor grad involverer dine overordnede seg i prosjektene og prosjektene sin fremgang?
5. Har du individuelle samtaler med prosjektmedlemmene underveis i prosessen?
    a. Fortell litt om innholdet i disse samtalene
    b. Blir du som prosjektleder evaluert av dine prosjektmedlemmer?
6. I hvilken grad blir nøkkelpersoner ført videre til lignende prosjekt?
7. Blir tilsatte "lønnet" med ansvar på nye prosjekt dersom de har vist gode evner på tidligere resultat?
    a. Kan dette være en god kilde til motivasjon?
8. Er du som prosjektleder med i en egen gruppe for prosjektledere der dere utveksler erfaringer?

***Tema 3: Læring***

1. Hvordan arbeider du med følgende faktorer blant dine prosjektmedlemmer?
    a. Motivasjon
        i. Indre eller ytre motivasjon som viktigste virkemiddel?
    b. Mestring
    c. Formativ vurdering
    d. Relasjoner
        i. Hvordan vil du anslå at relasjonen er til dine medarbeidere
        ii. Hvilken ledelsesfilosofi vil du si du følger når det gjelder relasjoner?
2. Hvilken ledelsesfilosofi vil du si du i hovedsak følger?

# Informasjon sendt til respondenter i forkant av intervjuene

An English version of this email can be found below the Norwegian version

Hei

Mitt navn er Andreas Reksten, og jeg skriver dette skoleåret masteroppgave på mitt MBA-studium ved Handelshøyskolen i Bodø. I oppgaven undersøker jeg nærmere hvordan systematisk læring forekommer i kunnskapsintensive prosjektorganisasjoner, og hvordan prosjektleder kan benytte seg av grunnleggende pedagogiske prinsipp for å fremme systematisk læring.

Oppgaven er utformet som et casestudium, der målet har vært å følge et prosjekt preget av ny teknologi og sammensatte problemstillinger, og med høy tetthet av ingeniører. Gjennom undersøkelser og innledende intervju har GSC vist seg å være et svært passende prosjekt for mitt casestudium. Oppgaven er utformet som et kvalitativt studium, der datainnsamlingen består av åpne intervju med et utvalg personer fra to ulike team i prosjektet.

For videre informasjon om oppgaven og dens innhold henviser jeg til presentasjonen som ligger vedlagt. Her finner dere også informasjon om oppgavens modeller, samt hva deres rolle vil være som intervjuobjekter.

Datainnsamlingen til masteroppgaven vil foregå i form av åpne, individuelle intervjuer. Hvert individuelle intervju vil ta opp mot 60 minutter, alt etter mengden spørsmål det er behov for å stille. Jeg ønsker å gjennomføre intervjuer i løpet av de to neste tirsdagene, altså tirsdag 21. oktober og tirsdag 28. oktober.

Det er ikke behov for noe forberedelse til intervjuene, foruten at jeg ønsker at dere i forkant tenker over følgende problemstillinger:

- Hva har vært store utfordringer for meg/mitt team siden prosjektstart?
- Hvordan løste vi disse utfordringene?
- Hvordan lærer jeg best?
- Hvordan blir jeg best motivert til å lære?
- På hvilke arenaer foregår det mest læring i prosjektet?

Jeg ønsker å ta opp alle intervju som lydfil. Hvis dere har motforestillinger mot dette er det fint om dere kan sende meg en tilbakemelding om det i forkant av intervjuet.

**Merk: Oppgaven og hele dens innhold går innunder Statoils konfidensialitetserklæring. Alle intervjuobjekt blir behandlet anonymt.**

Ta gjerne kontakt i forkant om noe skulle være uklart, eller om dere ønsker tilleggsinformasjon om oppgavens form og formål.

Med vennlig hilsen
Andreas Reksten

**English version**

Hello

My name is Andreas Reksten. This year I am writing my master thesis for my MBA study at Bodø graduate school of business. In my thesis I explore how systematic learning takes place within knowledge intensive project organizations, and how the project manager can make use of foundational pedagogical principles to promote systematic learning.

The thesis is conducted as a case study, where the goal is to follow a project recognized by a large degree of new technology, and with a high density of engineers involved. Through research and interviews GSC has shown to be a very suitable project for my thesis. The thesis is furthermore conducted as a qualitative study, where the data collection consist of open interviews with a selection of people from two different teams of the project.

For more information about the thesis and its content I refer to the presentation attached to this email. Note that it is in Norwegian. Please let me know if you would like to have it sent to you in English.

The data collection for the master thesis will be conducted through open interviews. Each interview will take up to 60 minutes depending on the amount of questions needing to be asked. I would like to carry out the interviews during the next two Tuesdays, October 21st and October 28th.

There is no need for you to prepare for the interview, except that I would like you to think about the following questions:

- What have been the biggest challenges for you and your team since project start?
- How did you solve these challenges?
- How do you learn best?
- How do you become motivated to learn?
- On which arenas does most learning take place in the project?

I would like to record all interviews. If you have any objections to this, please contact me ahead of the interview so that I am prepared.

Note: The thesis and all its content is bound by Statoil's declaration of confidentiality. In addition to this, all interview objects will be treated anonymously.

I look forward to meeting all of you. Please contact me in advance if you have any more questions, or if you would like more information about the thesis and its content.

Sincerely

Andreas Reksten

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# Samtykkeerklæring intervju

**Systematic learning in project organizations:** *How does learning take place in projects with a high level of knowledge intensity and new technology?*

Masteroppgave ved Handelshøyskolen i Bodø - 2014-2015

## Intervju av prosjektmedarbeidere ved GSC, Statoil ASA

**Hovedansvarlig oppgave**

Andreas Reksten

**Veileder**

Tommy Høyvarde Clausen

**Intervjuobjektet samtykker**

- At deltagelsen er frivillig
- At informanten er blitt informert om intervjuet i forkant
- At intervjuet vil bli tatt opp på lydbånd
- At intervjuet i etterkant vil bli transkribert i sin helhet
- At all referanse til intervjuet i masteroppgaven vil være fullt ut anonym og konfidensiell
- At informanter kan bli sitert anonymt i masteroppgaven

Ved å signere dette dokumentet godtar jeg vilkårene som er beskrevet over, samt at jeg kan trekke meg som deltager i denne masteroppgaven innen 15. desember 2014.

_____ _____

Dato og Sted Underskrift informant

UNIVERSITETET I NORDLAND

# Declaration of consent

**Systematic learning in project organizations:** *How does learning take place in projects with a high level of knowledge intensity and new technology?*

Master thesis at Bodø graduate school of business - 2014-2015

## Interview of project workers at GSC, Statoil ASA

**Main responsible person**

Andreas Reksten

**Mentor**

Tommy Høyvarde Clausen

**The person being interviewed consents to that**

- The participation is voluntary
- The informant have been informed of the interview in advance
- The interview will be recorded
- The interview will be transcribed immediately after the interview
- All references to the interview will in the master thesis be confidential and anonymous
- All informants can be cited anonymously in the master thesis

By signing this document, I accept the terms stated above, and acknowledge that I can withdraw my participation as informant in the master thesis before 15th of December 2014.

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Dato og Sted Underskrift informant